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Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Front cover: Hamburg, venue of the 36th IUPAC General Assembly.

International Union of Pure and Applied Chemistry

The President's Report

This is an abridged version of the Statutory Report of the President on the State of the Union presented by Prof. Yves Jeannin to Council at the Hamburg General Assembly.

President Yves Jeannin: 'We can be proud of our Union.'

Introduction

IUPAC is probably the largest of the scientific unions. It is largest in the scope of its activities, it has the largest number of commissions, the largest budget and it is also the largest because it is the only scientific union with a large industrial base and significant industrial participation.

Let me add that, as President of the Union, I have a definite feeling that IUPAC has a very high reputation and that we can be proud of our Union. This means that we all have a responsibility to maintain this high reputation, reached thanks to the efforts of many who have worked before us for the Union.

Divisions and commissions

The main activities of the various disvisions — which we can designate as the core activity of the Union — can be found in the reports of these divisions and in the *IUPAC Handbook 1989–1991*. This lists some 465 projects. It is interesting to look at this compilation as it reflects the intense activities of our commissions. I would like to highlight some of these.

In the Physical Chemistry Division, three major publications have appeared recently. One is *Measurement of the Transport Properties of Fluids*. This has had a real impact in the chemical industry. The second is the *Manual on Catalyst Characterization* and the third is *Perspectives in Catalysis* — a monograph in the new series called Chemistry for the 21st Century. The series was launched as part of the Union's restructuring programme.

In the Inorganic Chemistry Division, the great event was the publication of the third edition of *Nomenclature of Inorganic Chemistry* — a tremendous effort which kept the Commission busy for just over 10 years.

The Organic Chemistry Division published a very interesting provisional 'Guide to the IUPAC nomenclature of organic compounds', as part of the next edition of *Nomenclature of organic chemistry*. These two Divisions also started updating the 'Nomenclature of organometallic chemistry' — the provisional recommendations were issued in 1973. The Macromolecular Division published the first edition of its book of nomenclature entitled *Compendium of macromolecular nomenclature* — an enormous and complex task.

Since the Lund General Assembly, the Analytical Chemistry Division has been deeply involved in environmental matters. A monograph on *Sampling and characterization of environmental particles* is to be published this year (1991).

In the Applied Chemistry Division, two major publications may be mentioned: a 'Glossary of atmospheric chemical terms' — a timely publication when the chemistry of the atmosphere is under intense scrutiny — and a supplement to *Standard methods for the analysis of oils, fats and derivatives*.

The Clinical Chemistry Division has prepared, in a joint effort with the World Health Organization, a monograph on the *Safe use and disposal of chemicals in the laboratory*.

Finally, I would like to cite two other monographs being prepared for publication in the series 'Chemistry for the 21st Century.' One concerns 'Medicinal chemistry for the 21st Century' and has been prepared by the Medicinal Chemistry Section. The other is about 'Chemistry of advanced materials' and is being prepared under our mission-oriented programme Chemistry and Advanced Materials.

If I were asked to use one word to describe these activities I would use the word 'impressive'. However, there are some weaknesses which I shall discuss later on but this should not obscure the considerable amount of work undertaken by our members.

Committees

As far as the activities of committees are concerned, I would like to highlight some major events.

The Committee on Chemistry and Industry organized in September 1990 the first IUPAC Workshop on Safety in Chemical Production. This was held in Basel, the heart of the Swiss Chemical Industry, and brought essential and appreciable financial support to the organizers Dr Wyrsch and Dr Fischli.

The workshop was a great success. The organizers invited about 40 guests from countries where the

chemical industry is still fragile and under-developed. Besides several basic lectures, some industrial case studies were presented to participants who were divided into small groups. These groups actively studied special industrial situations in chemical companies (CIBA-GEIGY, Hoffman-La Roche and Sandoz) in particular examining safety rules and their applications. The Swiss Minister for Environmental Affairs presented a lecture at the closing session. The next workshop will be held in Japan.

I would now like to turn my attention to the activities of the CHEMRAWN Committee. The CHEMRAWN VII conference, to be held in Baltimore, USA in December 1991, is devoted to the chemistry of the atmosphere and its impact on global change. These problems have become so important that it is essential that IUPAC shows interest.

Another important event is CHEMRAWN VIII, which will take place in Moscow in 1992. Its title is 'World Conference on Chemistry and Sustainable Development towards a Clean Environment, Zero Waste, and Energy Efficiency.' It is our responsibility as chemists to undertake all possible efforts so that chemistry can still contribute to the improvement of the life of mankind, taking into account savings of resources, preservation of the environment, zero waste, and energy policy. Prof. Valentin Koptyug, our Past-President, will chair the organizing committee of CHEMRAWN VIII. The conference is being organized as a follow-up to the United Nations Conference on Environment and Development to be held in Rio de Janeiro in 1992. The United Nations Environment Programme (UNEP) is one of the cosponsors of CHEMRAWN VIII.

Relations with other international organizations

Another important point concerns relations that the Union has established with other international organizations. I must say this is not as successful as one would hope.

It is possible to group these organizations into scientific unions and more-general international bodies. With scientific unions, things are not easy because overlaps, when they occur, refer to matters seen by two unions from different points of view. With more general bodies, we must make stronger efforts to develop joint programmes — because this is an extremely good way of increasing the visibility of the Union. The presentation of programmes proposed by IUPAC to these organizations is best achieved through personal contacts. This means that the terms of members nominated to represent IUPAC must be sufficiently long.

Due to the patience and the expertise of Secretary General Prof. Tom West, the position of IUPAC within ICSU is now much better. Proposals for two programmes, one on the 'Consequences of the use of chemical weapons' as a follow-up to the successful ICSU programme on the 'Environmental Consequences of Nuclear War' and the other on 'World Energy Supplies' have been well received and are positive contributions of our Union.

As far as UNESCO is concerned, things are even more difficult owing to the priorities specified by the UNESCO General Council. Some time ago we received financial support to help launch our Affiliate Membership Programme. For some years, IUPAC has also received support for programmes prepared and implemented by our Commission on Teaching of Chemistry. Finally, a contract has recently been signed to develop a new Visiting Professor Programme in Latin America. Let me add that UNESCO is eager to develop more and stronger ties with IUPAC but this needs constant effort, the identification of good projects, a strong and active convenor, and the acceptance of UNESCO networks and UNESCO priorities.

CHEMRAWN VIII will be held in Moscow in September 1992.

New developments

It is now time to refer to new developments in IUPAC.

At Lund, the major endeavour undertaken, following discussions started at the Boston General Assembly, was the restructuring of the Union.

Several years ago, the Union was accused of being a charmed circle of distinguished gentlemen discussing problems of interest to them every 2 years. To counteract this it was necessary to involve more chemists in the work of IUPAC and increase the visibility of the Union. Accordingly, the IUPAC Affiliate Membership Scheme was launched. One attractive feature of the scheme was that it enabled the Union to reach out to developing countries. This year, we have 6940 affiliates — a slight decrease compared to the peak achieved 2 years ago. However, 938 affiliates are from developing countries. This is the highest number ever from these countries.

The Affiliate Membership Programme has enabled the Union to reach to almost 1000 chemists in developing countries

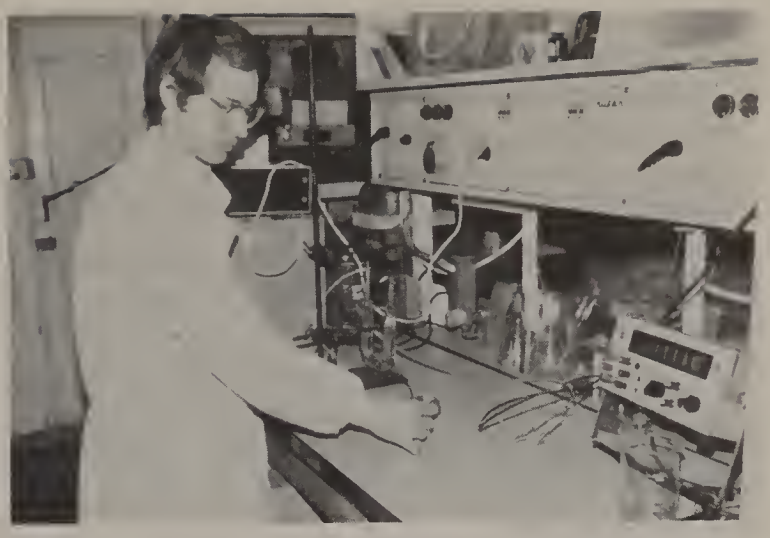
The Union is sometimes accused of being static since it discusses topics of interest only every 2 years. When a problem is first tackled it is often 'hot' and of general interest. However, the work of our commissions is sometimes considered to be too slow. By the time a final commission report is issued, the problem is not so hot. As a result of such prolonged work other hot problems are not tackled at all. For this reason, the idea of restructuring was launched and indeed the credit for identifying this problem must be attributed to our President-Elect, Prof. Allen Bard.

What has been done to solve this?

The Union currently has many active bodies engaged in a series of programmes. We cannot stop their work immediately since this would result in a loss of effort and money. At the Lund General Assembly, the Union decided to establish Limited Life Time Commissions (LLTCs). Each LLTC was set up to pursue a well-defined programme to be completed during the life-time of the commission, that is within 4 years. LLTCs on the following five topics were established:

- Isotope specific measurements as references
- Chromatography and other analytical separations
- Environmental analytical chemistry
- Instrumentation and software
- Biotechnology and clinical chemistry.

The Union decided at Lund to fund these LLTCs from assets for the 1990–1991 biennium — since no existing commissions had been dissolved. However, such funding from assets cannot be repeated so other methods of funding such activities need to be found.



Identification of appropriate projects is essential if the Union is to promote stronger ties with other international bodies.

President-Elect Allen Bard proposed amalgamations of some commissions. To extend the concept of LLTCs in the future it will be necessary to disband some commissions — although there are no immediate plans for such disbanding. Finally, I have asked Division Presidents to reduce some of the activities of their Divisions and to define priorities.

Even so, all this is not enough since we must continue with our restructuring programme. During the Executive Committee meeting in Pretoria, we noted from the Vice-Presidential Critical Assessment that some projects had been in progress for 10 years or more. We came to a decision that such projects should come to an end by the time of the Lisbon General Assembly at the latest.

These long-standing programmes have created problems for the commissions themselves. Our members, who are ready and willing to serve the Union, are under pressure from the ever onward march of chemistry and sometimes they over estimate the amout of work they can undertake. They then realize that chemistry is expanding so fast that they cannot tackle all the new problems. So what happens? They create working parties and subcommittees to take care of these problems. This method of working is valuable if it tackles a well-defined project in a well-defined period of time and if this group is chaired by a Titular Member to coordinate the work with core activities. Unfortunately, our members have been too enthusiastic in this direction and we now face a situation where we have some 47 working parties and 24 subcommittees. Occasionally they are even more static than statutory commissions.

There is an urgent need to contain this disordered growth. The occurrence of these groups shows a need for the expansion of the Union; it shows the impulse given by our members so that the Union becomes more active and more visible. But at the same time it costs money, particularly at the Oxford Secretariat, for an activity over which we do not have full control. For

this reason we have attempted to set up internal rules to tackle this problem — these rules may be regarded as a consequence of our success.

This is not the end of our restructuring programme. In Lund, Dr Mary Good identified new rapidly growing fields of activity. However, the amount of money at our disposal is limited by our income. Two major mission-oriented programmes were chosen: chemistry and the environment, and chemistry and advanced materials. These are currently financed from assets. This was possible because we have a comfortable level of assets. But once this 'comfort' is used up we are left with essential assets needed as a safety belt to cover unexpected events.

The present financial situation is such that we cannot at this time plan any more new programmes even though we have received good proposals — on chemistry and biosciences, and chemistry and computers for example.

Certainly the most advanced mission-oriented programme is the one on the environment. First, the need for this programme was crucial and second, some projects undertaken within IUPAC were already related to the environment. The interdisciplinarity of these problems needed good coordination for further development and so a committee, coordinated by Prof. Valentin Koptyug, was set up. Prof. Koptyug involved himself very deeply in this programme and we must thank him for his wonderful work. An inventory was published which identifies and lists all our recent and ongoing projects related to the environment. Michael Freemantle of the Oxford Secretariat greatly contributed to the preparation of the inventory.

Second, we launched under this programme new scientific projects funded from assets for this biennium. These projects are being operated by commissions and LLTCs. Prof. Koptyug will continue as Chief-Coordinator of the programme until the 1993 General Assembly and he has responsibility for approving any new project to be funded within this programme.

Conclusions

Let me now add a personal touch. My first work for the Union was to correct proofs of documents prepared by the Commission of Nomenclature of Inorganic Chemistry. I first attended a commision meeting at the 1965 General Assembly. Now, 26 years later, we are in 1991. Since I started, I have seen the Union working, expanding and moving ahead. The Union is often accused of being static, a closed circle, self-perpetuating. I am afraid there is some truth in this statement. But one thing is true: all the chemists I have met in the Union work hard for the Union. However, there is a tendency today to consider that the Union can do everything. This is of course not possible since we have financial limitations. Moreover, we are an international scientific union, not an international chemical

Council at Hamburg.

society. This means that, with chemistry still expanding rapidly, priorities have to be defined and projects to be undertaken must be carefully selected and brought to a conclusion in a reasonable time. It is certainly preferable to tackle a smaller number of projects and complete them faster.

Last but not least, I would like to give to you my views about the work of the President. The Officers of the Union — the President, the Vice-President, the Secretary General and the Treasurer — work as a team. However, the President is in charge of the Union for 2 years only. This is the period between the two General Assemblies (or between the two Council meetings). On the other hand the Secretary General and the Treasurer serve for 4 years — usually renewed for another 4 years. By the time the President has really understood the situation he must leave. The team cannot operate very well. I am strongly convinced that this 2-year term prevents the President from playing a leading role and greatly contributes to making the Union static. We must choose between a quicker turnover and more dynamic Union. May I point out that it was like that in the Union until 1963. Although the Bureau has not accepted my view, I make a plea in favour of that change — for a more vivid and more aggressive Union in the present international competition.

Let me say, finally, that I enjoyed very much my time as President. I would like to thank Profs Tom West and Anders Björkman for their invaluable support. Their great knowledge of the Union and of its mechanisms has considerably assisted me. I am grateful to Prof. Allen Bard for his great contribution. I would also like to express my personal gratitude to Dr Mo Williams and all the staff at the Oxford Secretariat for their assistance. The amount of work accomplished in Oxford is usually not realized — I would emphasize this because the work in Oxford is essential for the life of the Union.

The life of the Union has been my first concern during my 4 years as Vice-President and then as President. Further improvements are necessary but overall I would say that the Union is in good shape due to the activities of its members.

22nd FECS General Assembly

The 22nd General Assembly of the Federation of European Chemical Societies (FECS) was held in London, UK, on 25th June 1991. Seventeen of the 38 member societies from 26 countries were represented. After further lengthy debate the Israel Chemical Society, previously a Corresponding Member, was admitted to full Membership without changing the statutes of the Federation in respect of the geographical definition of Europe. Subject to confirmation that the All-Union Medeleev Society accepted that the Estonian Chemical Society was now independent, it was also agreed that the Estonian Society should be admitted to Membership.

In addition to the FECS annual report for 1990, written reports were received from nine Working Parties (Analytical Chemistry, Chemistry and the Environment, Computational Chemistry, Electrochemistry, Food Chemistry, History of Chemistry, Organometallic Chemistry, Professional Affairs, Chemistry in Conservation of the Cultural Heritage) and a verbal report from the WP on Chemical Education.

Slow progress is being made in re-issuing the 'Yellow Book', which describes the activities of all the member societies. In order to avoid unnecessary duplication with its WP on Analytical Chemistry, the Assembly decided not to support a proposal to establish a European Federation of Analysts' Associations Institutions. Dr J. Mrha tabled copies of a new booklet, which gives details of electrochemical research centres in several countries in Europe. The FECS Award for 1991 was to be presented to Dr P.B. Czedik-Eysenberg at Euro Food Chem VI at Hamburg during September 1991, in recognition of his work as Chairman of the Federation's WP on Food Chemistry.

Before setting up a Discussion Group on Medicinal Chemistry, the position will be clarified with the European Federation of Medicinal Chemistry. Consideration was given to a proposal to set up a new European Federation of Physical Chemistry. There was a strong feeling that the proliferation of 'Federations' should be avoided if at all possible. However, it was generally agreed that the alternative idea of forming an FECS Working Party was not attractive, because physical chemistry is such a broad area.

Clockwise from top left: Dr Wolfgang Fritsche (on right) with Dr Roland Darms, his successor in 1992 as Chairman of FECS Council. Prof. Dan Meyerstein (President of Israel Chemical Society). Dr Jiří Mrha (Chairman of FECS Working Party on Electrochemistry) with Michael Faraday, the bicentenary of whose birth was celebrated in 1991. Participants at the General Assembly (from the left): Dr Dalma Gyepesová (Slovak Chemical Society), Dr Maria Jose Calhorda (Sociedade Portuguesa de Chimica), Dr Ursula Hofacker (Chairman of FECS Working Party on Chemical Education), Ms Anneli Varmavouri (Association of Finnish Chemical Societies).

IUPAC by telex
In future all telex communications to the IUPAC Secretariat should be sent to: 83147 VIA OR G attn. IUPAC.

In 1992 Dr R. Darms (Swiss Committee of Chemistry) will succeed Dr W. Fritsche (Gesellschaft Deutscher Chemiker) as Chairman of the FECS Council, which acts for the Federation during the intervals between the annual General Assemblies. Although Germany is now re-united, the Assembly voted in favour of both Prof. E. Fanghanel and Dr Fritsche continuing as elected members of the Council.

Ir. E. J. de Ryck van der Gracht (Royal Netherlands Chemical Society) reported on recent activities of the European Communities Chemistry Council, of which he is Chairman. The recommendations of ECCC were now being accepted by the European Commission in Brussels, especially in respect of the recognition of qualifications: it is hoped that the designation 'European Chemist' will be launched in 1992.

It was reported by Dr Darms that the European Science Foundation had agreed to finance European Research Conferences on similar lines to the Gordon Conferences in USA. The existing EUCHEM meetings will become an integral part of the ESF conferences, and they are also to be opened to East Europe. The Federation decided to consider becoming a full member of EUCHEM. Prof. A. Zamojski announced that, after years of central domination, the Polish Chemical Society was resuming, starting in 1992, full responsibility for the editing and distribution of *Polish Journal of Chemistry* (formerly *Roczniki Chemii*: 1921–1977).

Four of the Federation's WPs are collaborating to organize the major conference EUROENVIRONMENT '92 on 'Chemistry and Waste' at Budapest during 10–14 May 1992. The European Federation of Chemical Engineering, which has similar interests, is being kept informed. Close contact was also recommended on these issues with IUPAC, which is preparing CHEMRAWN VIII, in conjunction with UNEP, UNIDO and EEC: World Conference on Chemistry and Sustainable Development towards a Clean Environment, Zero Waste and Highest Energy Efficiency (Moscow, 6–9 September 1992).

Dr M. Williams

Changes to atomic weight values

The Commission on Atomic Weights and Isotopic Abundances (II.1), at its meeting at the 36th IUPAC General Assembly in Hamburg, Germany, in August 1991, recommended significant changes to the atomic weight values of three elements. These changes are as follows:

Indium:	114.82 ± 0.01	to	114.818	± 0.003
Tungsten:	183.85 ± 0.03	to	183.84	± 0.01
Osmium:	190.2 ± 0.1	to	190.23	± 0.03

The Commission has recommended that the value of 272 be employed for the $^{14}N/^{15}N$ abundance ratio in air for the calculation of atom per cent ^{15}N from relative nitrogen isotope abundance ratio measurements.

J. R. De Laeter, Chairman, Commission II.1

Coverage of 36th IUPAC General Assembly

Because of the production schedule of *Chemistry International*, it was not possible to publish reports of the Hamburg General Assembly in the September and November 1991 issues of the magazine — apart from the 'Names and addresses' pull-out which was submitted as camera-ready copy and published in the November issue. The earliest we could publish any of the reports submitted at or after the General Assembly was in this issue of *CI*. Unfortunately, there are such a large number of these reports that we are unable to publish them all in a single issue of the magazine. Some reports will therefore be published in the next issue and even possibly in the May 1992 issue. My apologies to authors for keeping you waiting so long for publication of your reports. (*Editor*)

Protein stability — theory and practice

The Workshop on Protein Stability — Theory and Practice took place at Girton College, Cambridge, UK on 1–5 July 1991. The workshop was organized and financed mainly by Pafra Ltd, Biopreservation Division. It was supported by the Biotechnology Group of the Royal Society of Chemistry and the Steering Committee on Biophysical Chemistry of IUPAC.

The workshop attracted 84 participants from Australia, Europe, Israel, Japan, USA and USSR. Two-thirds of the participants came from industry, and the remainder from universities and other public institutions. Student bursaries were given to participants from Germany, Italy, Spain, UK and USSR.

Prof. Brigitte Zentgraf (Institut für Biotechnologie, Leipzig, FRG) is a member of the IUPAC Steering Committee on Biophysical Chemistry and Coordinator of the Working Party on Protein Stability

We regret to record the deaths of

Dr L. E. Coles, UK (12 August 1991) — President of Applied Chemistry Division (1989–91)/Vice-President and Secretary (1983–89), Commission on Food Chemistry (1979–91), Commission on Food Contaminants (1971–79), *Chemistry International* Editorial Advisory Board (1983–91).

Prof. O. Horn, FRG (29 September 1991) — Treasurer of IUPAC (1971–79), Finance Committee (1963–71), Macromolecular Division Committee (1968–71).

Dr H. A. Willis, UK (20 November 1990) — Commission on Molecular Structure and Spectroscopy (1975–87).

Dr Lewis Coles

The workshop consisted of lectures on:

- Structure, stability and dynamics of proteins
- Extremophiles as a natural source of thermostable proteins
- Stabilization of proteins by immobilization, chemical modification and protein engineering
- Quality and safety aspects of plant-scale protein isolation and purification
- Proteins as shelf-stable products: lyophilization and beyond
- The design of stable proteins: role of computational approaches
- The construction of a protein stability database.

The workshop also included a series of round-table discussions on these topics. Workers of fundamental and applied sciences discussed their problems, which was one aim of the workshop. In addition, young scientists were trained in the field of protein stability — another aim of the workshop.

During the final discussion, it was stressed that protein stability is in the forefront of enzyme, genetic and protein engineering as well as biocatalysis research. It was felt that international organizations should concentrate their activities on basic concepts including definitions of the terms used in the field of protein stability because there are a number of different definitions of terms. This causes misunderstanding amongst researchers.

Brigitte Zentgraf

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairpersons and secretaries and IUPAC officers were published in the November 1991 issue of *CI* (Vol. 13, No. 6, pp. 223–233). The IUPAC Secretariat has been notified recently of the following appointments, additions and changes.

Dr A. J. Barrett (Secretary, IUB–IUPAC Joint Commission on Biochemical Nomenclature). Tel: +44 (223) 412972 or +44 (223) 243231.

Prof. J. Corish (Chairman, Commission on High Temperature and Solid State Chemistry — II.3). Fax: +353 (1) 712826.

Dr H. A. Favre (Chairman, Commission on Nomenclature of Organic Chemistry — III.1). Department de Chimie, Université de Montréal, BP 6128, Succursale A, Montréal, Québec H3C 3J7 Canada. Tel: +1 (514) 343 6516. Telex: 055 60944 CA. Fax: +1 (514) 343 6624.

Dr L. Fox (Chairman, Commission on Biotechnology — VI.2). Biotechnology Center, PO Box 3011, M. C. F-2, Naperville, IL 60566–7011, USA. Tel: +1 (708) 420 5875. Fax: +1 (708) 420 3845.

Mr E. W. Godly (Secretary, Commission on Nomenclature of Organic Chemistry — III.1). 10 Lawrence Avenue, New Malden, Surrey KT3 5LY, UK. Tel: +44 (81) 330 5124. Telex: 265871 MONREF G quoting DTI 007. Fax: +44 (81) 943 2767.

Dr C. Jochum (Secretary, Committee on Chemical Databases). Tel: +49 (69) 7917411.

Prof. V. A. Koptyug (Chief Coordinator, Chemistry and Environmental Programme). Fax: +7 (095) 230 20 43 or +7 (095) 230 26 20.

Mr M. Lauritzen (Secretary, Commission on Quantities and Unites — VII.2). Novo Nordisk A/S, Produktionsvej 8, DK-2600 Glostrup, Denmark. Tel: +45 (44) 490033 Ext. 9793. Fax: +45 (44) 530161.

Dr H. Olesen (Chairman, Commission on Quantities and Units — VII.2). Tel: +45 (35) 45 35 45 Ext. 7687.

Dr M. Salomon (Chairman, Commission on Solubility Data — V.8). US Army Electronics Devices, Technology Laboratory), Mail Stop SLCET-PR, Fort Monmouth, NJ 07703–5601, USA.

Prof. K. V. Sané (Chairman, Committee on Teaching of Chemistry). Fax: +91 (11) 687 3351.

Prof. G. Svehla (Secretary, Analytical Chemistry Division). Fax: +353 (21) 274097.

Prof. R. P. T. Tomkins (Secretary, Commission on Solubility Data — V.8). Fax: +1 (201) 596 8436.

Information for Affiliates

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1991–93 was published on pages 223–233 of the November 1991 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually (but not always) announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International (CI)*, please indicate that the letter is 'Submitted for publication in *CI*.'

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Telex: 83147 VIA OR G
attn. IUPAC

Free copies of booklet available to affilitates

Copies of an attractive 64-page illustrated booklet on *The IUPAC programme on chemistry and the environment* have been distributed to members of IUPAC commissions and committees, national adhering organizations and other bodies associated with IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Secretary.

Safety in chemical production

For information concerning Proceedings of the 1st IUPAC Workshop on Safety in Chemical Production, held in Basel, Switzerland, September 1990 please contact one of the officers of the IUPAC Committee on Chemistry and Industry: (Chairman): Prof. Albert E. Fischli, Pharma Division, Preclinical Research, F. Hoffman-La Roche Ltd, CH-4002 Basel, Switzerland; (Secretary): Dr Rene-Paul Martin, Director of Innovation, Société Nationale Elf Aquitaine, Tour Elf Cedex 45, F-92078 Paris-La Défense, France.

Provisional recommendations

Page 24 of this issue of the magazine contains the synopses of two sets of Provisional Recommendations:

- 'Nomenclature and terminology of graphite intercalation compounds' prepared by the commission on High Temperature and Solid State Chemistry (II.3)
- 'Nomenclature of regular double-strand (ladder and spiro) organic polymers' prepared by the Commission on Macromolecular Nomenclature (IV.1).

All comments on these reports are welcome and will be taken into consideration. If you would like to comment, please write to your nearest national/regional centre requesting a copy of the full report. The most up-to-date list of national/regional centres appears on page 25 of this issue.

Twenty of the affiliates who registered an interest in the work of Commission II.3 have been sent copies of the their report and their comments invited. Similarly 20 other affiliates have been sent copies of the Commission IV.1 report. This is a new initiative for affiliates and follows a recommendation of the Committee on Affiliate Membership at its meeting in Hamburg last August.

IUPAC Publications

Affiliates are entitled to a 25% reduction on the cost of all IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications, together with an order form, may be obtained from the IUPAC Secretariat.

Analytical nomenclature

On page 12 of this issue, Dr Colin Graham, Secretary of the Commission on General Aspects of Analytical Chemistry reports that a third edition of the *Compendium of analytical nomenclature* (the Orange Book) is planned. This involves updating and supplementing the chapters with additional terms. He writes: 'this will be a lengthy task and it is one in which the general analytical community could provide valuable assistance.' Suggestions are welcome and should be sent to:

Dr Colin L. Graham, School of Chemistry, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK. Tel: +44 (21) 414 4415. Telex: 338938 SPAPHY G. FAX: +44 (21) 414 4403.

Reference materials

The IUPAC Subcommittee on Reference Materials in Chemistry is collecting documentation of unmet requirements for certified reference materials. If you have unmet requirements please turn to page 10 and send your information to the Chairman of the Subcommittee, S. D. Rasberry, B-354 Physics, NIST, Gaithersburg, MD 20899, USA.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Letter to the Editor

Names of elements

Sir,

I should like to make some suggestions about the names of elements, and to ask readers for their comments on them.

Element 86: I suggest that the older nomenclature for this element be reinstated, namely the generic name *emanation* (Em) for the element, and the specific names *actinon* (An), *thoron* (Tn), and *radon* (Rn) for isotopes 219, 220, and 222, the emanations from actinium, thorium, and radium respectively.[1] This would make the nomenclature more accurate, and bring it into line with that recommended for element 1, namely *hydrogen* for the element, and *protium, deuterium*, and *tritium* for isotopes 1, 2 and 3.[2,3] As radon is the isotope that is most frequently encountered, the change is a small one, and should not be too troublesome to make.

Element 104 onwards: I suggest that IUPAC makes it more widely known that the systematic names recommended for these elements (e.g. *unnilquadium* for element 104) are only intended to be used until ordinary names can be agreed on. Although this was implied when they were introduced,[4] and has since been stated explicitly,[5] many textbook writers treat these names as if they were final. For permanent use they are most unsuitable, being too colourless, and easily confused.

Elements 2, 10, 18, etc: I suggest that these elements be called the *inactive* gases. This accurately describes what they are: gases that are not chemically active, that do not react with many other substances. The present name *noble gases* is unsatisfactory. The adjective noble implies loftiness of character or illustriousness of rank. This term is very suitable for a metal like gold, which resists corruption by air and is used for majestic purposes. It is less suitable for an inactive gas, since perfection in gases is usually reckoned in relation to the gas law, and no inactive gas has the illustrious applications that gold has.

Dr P. G. Nelson
The University of Hull
UK

References

1. Sidgwick, N. V., *The Chemical Elements and Their Compounds*, Oxford University Press, Vol. I, p. 8, 1950.
2. Leigh, G. J. (Ed.), *Nomenclature of Inorganic Chemistry*, Blackwell Scientific Publications, 1990.
3. Toby, S., *CI.*, Vol. 10, No. 6, p. 230, 1988.
4. Chatt, J., *PAC.*, Vol. 51, p. 381, 1979.
5. Nelson, P. G., *CI.*, Vol. 11, No. 5, p. 180, 1989.

Commission & Committee News

The following are reports of some of the commission and committee meetings which took place at the 36th IUPAC General Assembly in Hamburg in August 1991. They were submitted as 'Summary Minutes' by the chairman or secretaries of these bodies. More reports will appear in the next issue of the magazine.

Applied Chemistry

The sad demise of Dr Lewis Coles, President of the Applied Chemistry Division, while at the General Assembly, overshadowed all other issues when the Division Committee met at Hamburg. He had served with IUPAC since 1971, initially with the Commission on Food Contaminants and later on the division and other committees. He will be missed.

The proposed amalgamation of the Commission on Atmospheric Chemistry (VI.4) with the Commission on Water Chemistry (VI.6) and also the Commission on Food Chemistry (VI.1) with the Commission on Agrochemicals (VI.5) did not appear logical in view of the lack of common projects. It would also result in a major reduction in the IUPAC Programme on Chemistry and the Environment which has a high priority because of the concern in society with regard to the use of chemicals. These views were expressed by Drs Steyn and Greenhalgh at a meeting of Division Presidents and Secretaries.

At the General Assembly, two aspects of the ACD programme became apparent. There was increased emphasis on environmental issues and collaboration between ACD commissions. By their nature, environmental problems are multidisciplinary. This was clearly illustrated at a workshop held by the Commissions on Water and Agrochemicals on 'Behaviour of pesticides in water catchments — modelling and land use practises.' The Commission on Biotechnology (VI.2) also held an open meeting during the General Assembly on 'Biotechnology and the environment.'

Next year two symposium-workshops are planned as part of the out-reach programmes to help developing countries and technology transfer. One will be in Thailand on 'Health and safe use of pesticides in South East Asia' and the other in Mexico on 'Mycotoxins and phycotoxins.' These will be organized by the Commissions on Agrochemicals and Food Chemistry respectively. In addition, the Commission on Atmospheric Chemistry has been involved with the programme committee for CHEMRAWN VII — the World Conference on Chemistry of the Atmosphere: Its Impact on Global Change (Baltimore, Maryland, USA, 2–6 December 1991).

A draft of the ACD 'Blue book,' a compilation of memberships, projects, publications and terms of reference was tackled. Once it has been updated with the new projects it will become the common working document for all ACD matters.

At a meeting with the chairmen and secretaries of ACD commissions, the new President, Dr Steyn discussed projects and called for more collaborative projects between commissions. Such projects will be reported by all commissions involved even though there should be only one lead agency.

Roy Greenhalgh

Applied Chemistry Division President Dr Piet Steyn (left) and Division Secretary Dr Roy Greenhalgh in Hamburg.

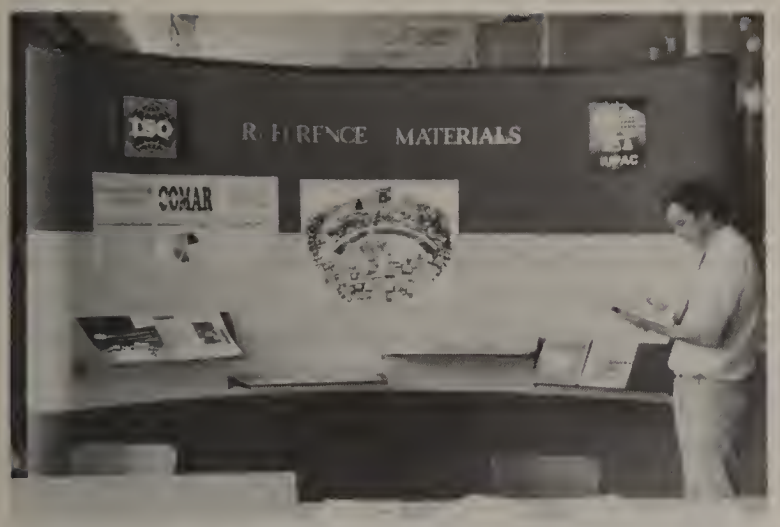
Reference materials in chemistry

During the three principal days of the General Assembly the Subcommittee on Reference Materials in Chemistry displayed catalogues from a representative selection of producers of Certified Reference Materials (CRMs) throughout the world.

The use of the database COMAR to locate sources of CRMs with specified properties was demonstrated for 2 days, and discussions on the use and availability of CRMs were held at the display stand.

Survey forms were available for unmet needs for reference materials to be recorded for subsequent circulation to the principal produces via ISO/REMCO (International Organization for Standardization/Reference Materials Committee of ISO).

A. J. Head



Reference materials display stand at Hamburg.

Atomic weights and isotopic abundances

Twenty members of the Commission on Atomic Weights and Isotopic Abundances (II.1), including national representatives and observers, met for 4 days during the 36th IUPAC General Assembly in Hamburg. Six new members were elected to the Commission. Prof. K. G. Heumann, University of Regensburg in Germany, is the incoming chairman and Dr T. Coplen, USA Geological Survey in Reston VA, was elected to be the next secretary of the Commission.

The Commission has revised its table of atomic weights. The data of three elements have been changed. Due to new determinations of the isotopic abundances the atomic weight of indium was changed from 114.82(1) to 114.818(3), of tungsten from 183.85(3) to 183.84(1) and that of osmium from 190.2(1) to 190.23(3). These new data are a significant improvement on the previous values which were based on early mass spectrometric determinations carried out between 1937 and 1956.

The Commission has recommended that the value of 272 be employed for the $^{14}N/^{15}N$ ratio in air, for the calculation of atom per cent ^{15}N from relative nitrogen isotope ratio measurements. On the basis of the present (rounded) IUPAC data (see Commission's Report 'Isotopic Composition of the Elements' *PAC*, Vol. 63, No. 7, pp. 991–1002, 1991) of 99.634% ^{14}N and 0.366% ^{15}N some workers have used the $^{14}N/^{15}N = 272.22$ despite the fact that the five significant figures are not justified.

During the last 2 years the Commission notes that potassium isotope variations have been found in terrestrial minerals. The annotation 'g' has, therefore, been added to this element which means that geologically exceptional specimens are known in which the element has an isotopic composition outside the limits for normal material.

Considerable discussion took place on the terminology and other problems associated with the term 'atomic weight' (relative atomic mass). As a result the Commission will review some of its procedures, and a paper setting out the history of the debate will be published in *PAC*.

During the days before Hamburg meeting the Commission's Subcommittee for Isotopic Abundance Measurements, the Working Party on Natural Isotopic Fractionation and the Working Party on Non-Terrestrial Isotopic Abundance Data met in a hotel in Malente about 100 km north-east of Hamburg. The Working Party on Statistical Evaluation of Isotopic Abundances met in Hamburg during the General Assembly.

The chairman of the Subcommittee for Isotopic Abundance Measurements, Prof. K. J. R. Rosman from the Curtin University of Technology in Perth, Australia, gave a detailed element by element report to the subcommittee about new measurements of the isotopic composition. As a result it was decided to change the atomic weights of indium, tungsten and osmium.

The Working Party on Natural Isotopic Fractionation has continued its evaluation of the literature under the chairmanship of Dr T. Coplen with a view to publication in approximately 3 years. However, a summary report will be published as a Commission document in about 1 year, following a meeting to be held in 1992 under the new chairmanship of Prof. A. R. Krouse, Physics Department of the University of Calgary, Canada.

SURVEY: Unmet requirements for CRMs

The IUPAC Subcommittee on Reference Materials in Chemistry is collecting documentation of unmet requirements for CRMs (Certified Reference Materials) in liaison with the Reference Materials Committee (REMCO) of ISO.

The subcommittee will forward the survey forms it receives to REMCO for circulation to products of CRMs. If you have unmet requirements, the subcommitte will be pleased to receive information from you on the following seven points.

1. Kind of material.
2. Characteristics and ranges to be certified.
3. Is the material needed for specific test methods and/or instruments? (If 'yes', please provide details.)
4. Potential sources for starting materials.
5. Potential experts to cooperate in certification measurements.
6. Name, address, telephone and fax numbers of person completing form.
7. Are you willing to be contacted if further information is needed?

Please send this information to the Chairman of the IUPAC Subcommittee on Reference Materials in Chemistry, S. D. Rasberry, B-354 Physics, NIST, Gaithersburg, MD 20899, USA.

Commission II.1 in Hamburg.

The chairwoman of the Working Party on Non-Terrestrial Isotopic Abundance Data, Dr M. Shima from the National Science Museum in Tokyo, Japan, reviewed about 200 papers for the information of the Working Party to produce a brief summary report which will be published as part of the 'Table of Atomic Weights 1992'. The large database, which is of great interest to cosmochemists, will also be publshed within the next 2 years.

At the end of the meeting the Commission expressed its warmest thanks to Prof. J. R. De Laeter from the Curtin University of Perth, Australia, for his outstanding work. After a 12 years' service for the Commission, where he was Secretary (1983–1987) and Chairman (1987–1991) as well, his membership ended in 1991. The Commission congratulated Prof. De Laeter for his election as a member of the Inorganic Division where he will be able to continue part of the work he initiated in the Commission.

The next Commission meeeting will be held in Lisbon, Portugal, in 1993 during the 37th General Assembly.

Prof. K. G. Heumann

Glossary of terms used in physical organic chemistry

The Working Party for the Glossary of Terms used in Physical Organic Chemistry, chaired by Prof. P. Müller, has reviewed terms employed in the first edition and made changes based on recommendations to the Commission on Physical Organic Chemistry (III.2).

One such change that will be of interest to chemists is the proposed definition of '**molecule**' as 'an electrically neutral entity consisting of a well-defined number of atoms. Rigorously, a molecule must correspond to a depression on the potential energy surface deep enough to confine at least one localized vibrational state.'

The Commission also made a major change in the definition of the term **strain**: 'Strain is present in a molecular entity or transition structure if its energy is increased because of unfavourable bond lengths, bond angles, or dihedral angles relative to a standard.'

The terms being developed are intended to be straightforward and able to be used broadly. Review of terms being defined by other commissions that overlap with those of Commission III.2 reinforced the need for joint efforts and collaboration and these have been undertaken.

Progress by the Working Party on Structure–Reactivity Parameters and Equations, chaired by Prof. J. Shorter, was reviewed by Commission III.2 at its Hamburg meeting. General approval was given to the incorporation of reliable substituent constants. Even reliable substituent constants should be understood to be usable to only two decimal places, however. Interest in this project and its applications in models for reactivity have been received and acted upon.

A **molecule** may be defined as an electrically neutral entity consisting of a well-defined number of atoms

Two new projects, one on 'Theoretical organic chemistry' and another on 'Molecular modelling' have been initiated. Working parties are being organized and coordination with compatible efforts by other commissions will be undertaken. The project on molecular modelling is intended to address the compatibility and accuracy of computer programs and data. One particularly important component will be to define a computational set of molecules for use in testing the viability and accuracy of a new program.

The next meeting of Commission III.2 will be held in Ithaca, New York, USA, on 7–10 August 1992.

Prof. Michael P. Doyle

Analytical unification

During the 35th General Assembly at Lund, the Analytical Chemistry Division decided to unify most of the activities of the Commission on Analytical Reactions, Reagents and Separations (V.1) with those of the Commission on Nomenclature (V.3) and form the Commission on General Aspects of Analytical Chemistry (V.1). Although it will be some time before all the existing projects of the merged Commissions are published, new projects adopted by the reconstituted V.1 will be either of the classification or of the nomenclature type. Projects on separations and related topics are now being managed by the newly created Limited Life Time Commission on Chromatography and Other Separations.

The success of the merger owes much to the efforts of the Chairman and Vice-Chairman of the new V.1, Prof. Folke Ingman and Prof. Rene van Grieken. Un-

fortunately, both must now retire as Titular Members under IUPAC Bylaws; however, the completion of the remaining aspects of integration will be carried out under the Chairmanship of Prof. Willem van der Linden, the former Secretary of Commission V.1.

Since the Lund General Assembly, four main projects have been completed: Nomenclature of Sampling; Classification and Characterization of Chemical Sensors; Practical Considerations of Metal Buffers — Part II; and Present and Future Status of Organic Analytical Reagents — Part IV (Absorption Spectrophotometry of Metals).

Projects launched by the Commission at Hamburg will deal with various analytical aspects of calibration; the use and abuse of the term 'absolute' in the analytical literature; the use of immobilized enzymes; and aspects of solid phase extraction.

The Commission will also have an important role to play in the proposed revision of the *Compendium of chemical terminology* (the Gold Book), a revision of the *Compendium of analytical nomenclature* (The Orange Book), and may be involved in the production of a reference book on chemical terminology for teachers, students, authors, etc. Regarding the Orange Book, it is now 6 years since the present edition was published and, quite apart from the need to update the chapters, it is essential that some are supplemented. For example, some important and commonly used spectrophotometric terms are absent. This will be a lengthy task and it is one in which the general analytical community could provide valuable assistance to Commission V.1 by drawing attention to terms which should be added to the third edition of the Orange Book. Suggestions will be welcome and should be sent to the Secretary, Dr Colin Graham.

Dr Colin Graham

Environmental analytical chemistry

Environmental Particles Programmes I and II

The first programme of the Analytical Chemistry Division Limited Life Time Commission on Environmental Analytical Chemistry started in 1989 and is concerned with the characterization of environmental particles. Within this programme, 13 reports on various aspects of the sampling and characterization of atmospheric and aquatic particles, as well as on the reactivity and transport properties of particles in aquatic systems, have been completed. The preparation of these reports has included a plenary discussion meeting in Wageningen, The Netherlands, with all the project coordinators. Active support was given by the Analytical Chemistry Division Committee. Publication in the form of a monograph is due for January 1992.

The Commission endorsed the launching of a second programme on environmental particles, with 12 contributions from international top-level specialists. One category of subjects deals with environmental particle characterization techniques such as field–flow fractionation, size distribution measurements by photon correlation, spectroscopy, NMR and EXAFS for surface analysis.

Other chapters highlight certain types of particles, for example manganese particles in freshwaters, carbonaceous particles in freshwaters, carbonaceous particles in the atmosphere, particulate organic carbon in seawater and particulate matter with organic coatings. Particle formation and aggregation processes are also analysed and the role of particles in the transport of contaminants is explained. Draft reports of the various projects were discussed at a special programme meeting on 11–13 October 1991 in Davos, Switzerland, and revised accordingly. A review of the Analytical Chemistry Division committee has since been carried out in a way similar to that for 'Environmental Particles — I.'

Bio-active chemical species programme

The Commission made the decision to start with the preparation of a new main programme under the collective title 'Bio-active Chemical Species.' This will start in the autumn of 1991 under the auspices of the International Council of Scientific Unions (ICSU). It will treat the nature of chemical species which are available for (or released by) organisms and which may have an important ecological significance. The analytical methods used and the environmental mechanisms controlling bioavailability will also be covered.

Longer-term plans

The Commission is also planning to initiate programmes on environmental interphases (structure, analysis and fluxes), and on environmental monitoring. In order to organize the extensive work in an efficient

Environmental Particle Programme I included reports on the reactivity and transport properties of particles in aquatic systmes.

way, the Commission has proposed to create a Subcommittee on Enviromental Interphases.

Within the framework of the horizontal 'Chemistry and Environment Programme', the Commission is in communication with several other commissions concerning speciation and environmental colloids. Further on-going projects of the Commission include the determination of the pH of atmospheric wet desposition (acid rain), the direct applicability of voltametric methods for freshwaters and the use of adsorptive stripping voltametry for the determination of trace elements in seawaters. These projects are carried out in cooperation with the Commission on Electroanalytical Chemistry (V.5).

The Commission will have an even-year meeting in October 1992.

Dr Herman P. van Leeuwen

Environmental aspects of biotechnology

The Commission on Biotechnology (VI.2) reviewed progress on projects and feasibility studies when it met in Hamburg. The commission decided to focus on fewer projects and ensure adequate progress on these rather than diversify too much.

The 'Glossary of terms' project has been finalized and is to be published in *PAC* in the near future. Translations into five languages (French, German, Japanese, Russian and Spanish) have been completed or are in preparation and will be published as a book by Blackwell Scientific Publications. The glossary will be a unique tool for chemists and other scientists for the better understanding of expressions used in the mutidisciplinary field of biotechnology. The multilingual version will promote a better understanding of foreign-language publications and help in the preparation of talks in another language.

The project 'Interrelationships between organic chemistry and biotechnology', which is an ongoing series of publications in *PAC*, is still in excellent shape. There were two publications in 1990 and a further one was expected by the end of 1991. The first was published in 1987.

An open meeting on 'Biotechnology and the environment' was organized by the commission during the Hamburg General Assembly. About 50 scientists attended the meeting. Speakers included George Alexander Zavarzin, Vice-Minister of Natural Resources of the USSR. He spoke on 'Sustainability of the biosphere.' John F. Rees from J. F. Scientific, UK, presented a talk on 'Treatment of contaminated ground and groundwater' and commission chairman Manfred Ringpfeil lectured on 'Biological production of large-volume low added-value products.' Larry Fox, vice-chairman of the commission, lectured on 'International biotechnology regulations.' This open meeting was part of a feasibility study for an international symposium on 'Biotechnology and the environment.' It has been suggested that this symposium is organized as a CHEMRAWN meeting.

A feasibility study with the working title 'Risk assessment in biotechnology' has also been suggested. Ideas being evaluated include a source book on studies concerning the release of genetically engineered organisms. The objectives relate to a more realistic assessment of the hypothetical dangers involved, degradation of chemicals in the environment, as well as the safety of biopesticides. Concerning the last topic, the commission is proposing to cooperate with the Commission on Agrochemicals (VI.5).

Commission VI.2 in Hamburg.

During the Hamburg General Assembly, the commission held joint meetings with the Medicinal Chemistry Section, and the Limited Life Time Commission on Biotechnology in Clinical Chemistry. A joint meeting with the Steering Committee on Biophysical Chemistry led to common undertakings in the form of a working party on protein nomenclature and stability and a project on physico-chemical methods for investigation of cell states.

The commission also discussed the International Biotechnology Symposia (IBS) sponsored by IUPAC through the commission. Plans are underway for the following symposia:

9th IBS	16–21 August 1992, Crystal City, Virginia, USA.
10th IBS	1996, Sydney, Australia.
11th IBS	2000, to be determined. Proposal: Berlin, Germany.

The next commission meeting will be held on 13–15 August 1992 in the Washington, DC, area (USA) in conjunction with 9th IBS.

Dr Heinz Kölbl

Water chemistry, pesticides and the environment

The Commission on Water Chemistry (VI.6) met in Hamburg to discuss the status of its present projects, to initiate new projects, and to start preparing a number of future activities. Following the meeting of the Commission, a workshop was organized on the behaviour of pesticides in water catchments, a report of which will be published separately in the next issue of *CI*. At the meeting it was concluded that the activities of the Water Chemistry Commission seem to be improving; at the moment several papers are approaching completion, one is now being published, and the proceedings of the pesticide-workshop will also be published shortly afterwards.

Projects approaching completion

The project on 'The Use of Quantitative Structure Activity Relationships(QSAR's) for Predicting Environmental Process Parameters' was successfully terminated with a publication in the October 1991 issue of *PAC*.

As a follow-up to this project, a workshop on 'QSAR Biodegradation' will be organized following the 1992 Commission meeting.

Following additional input from Commission members on a first draft document on 'Leaching Tests to Assess Pollution Hazards to Ground Water', the coordinator of this project, Dr Waldman, prepared an update of the draft document. This document will be ready for submission for publication in *PAC* by the end of October 1991.

The coordinator of the project 'Organics and Metals in Sewage Sludge', Prof. Franz Malz, unfortunately had to leave the Commission for reasons of ill-health. However, since one of his co-workers is prepared to play an active part in the Commission, it was agreed that the draft manuscript which has already been prepared will be reviewed by this new Commission member, Dr Korber, in order to have it ready for publication in *PAC* as soon as possible.

New and ongoing projects

The present work of the Commission may be subdivided into two categories.

1. Two projects to be carried out jointly with the Commission on Atmospheric Chemistry (VI.4) on: (a) assessing the impact of air pollution on water quality, with special emphasis on groundwater quality, and (b) the fate of chlorofluorohydrocarbons (CFCs) halon substitutes in the environment. This study deals with the observation that until now the risks associated with the increasing usage of freon-substitues are insufficiently recognized. A study will be performed on the enviromental fate of hydrofluorohydrocarbons (HFCs) and hydrochlorofluorohydrocarbons (HCFCs). This study will address both the tropospheric chemistry of these compounds (reactions and products of tropospheric oxidation and the fate of secondary products) as well as their biospheric chemistry (distribution and reactions of tropospheric oxidation products).

2. Projects to be carried mainly within the Water Chemistry Commission on the following.

(a) The use of immunoassays for water monitoring. On the one hand this project aims to collect data applications of immunoassays for monitoring for instance herbicides, alflatoxins, steroids and other chemicals in surface and groundwaters, whereas on the other hand recommendations will be drawn together on the best ways to use immunoassays for water monitoring.

(b) Methods to be used for the *in situ* treatment of groundwater. The outcome is intended to be a critical review giving the present state of the art on this subject.

(c) A glossary of nomenclature for water chemistry.

Possible future projects

Several possible projects were discussed at the meeting. It was decided that feasibility studies will be initiated in the following fields:

- Methods of standardization: This project will deal with the concern that is now widespread about the accuracy of analytical data. Despite the fact that methods capable of adequate performance have long been available, in many areas of analysis the accuracy of data continues to be poor.
- Special problems with regard to chemical analysis of waste water. Information will be collected on issues like sampling frequency, methods of sampling, methods of filtration, methods for distinguishing between dissolved and undissolved concentrations, with the emphasis on both metals and organic compounds.
- Methods related to the treatment of sludge and sewage. The main issue that will be dealt with is the setting of standards with relation to pollutants in sewage and sludge.
- Carbon species in oceanic waters and the greenhouse effect.
- The analysis of dissolved and particulate materials in surface water, these materials being a major source of analytical error.
- Polar organic substances in waste water. This project will include topics like: transport, complexation, HPLC-analysis, ionchromatographical methods, GC-MS methods, electrophoresis.
- Speciation models for heavy metals in the environment.

The next meeting will either be held in Prague, Czechoslovakia or in Bilthoven, The Netherlands, jointly with the one-day workshop on 'QSARs Biodegradation, 18–19 or 25–26 September 1992.

Dr Willie Peijnenburg

Science in South Africa

The 1991 meeting of the IUPAC Executive Committee took place in Pretoria at the offices of the Foundation for Research Development. Following the meeting, several members visited places of scientific interest in the country. *CI* Editor Mike Freemantle reports.

Introduction

While still a developing country, South Africa is by far the most developed country on the African continent and has become the economic mainstay of Southern Africa. The country's main exports include raw materials, minerals and agricultural products.

South Africa is one of the world's greatest mineral treasure houses. It has the largest known reserves of gold, chromium, platinum, vanadium, manganese, andalusite and fluorspar as well as substantial deposits of many other minerals such as coal, uranium, diamonds, iron ore, antimony, asbestos, nickel and phosphates.

The country is situated at the southern tip of Africa flanked by the Indian Ocean to the east and the Atlantic Ocean to the west. It contains a diversity of climatic regions and encompasses ancient sub-tropical forests, mountains and long beaches — the coastline is 2954 km although there are few natural harbours.

Key developments in South Africa's history were the discovery of diamonds in 1867 and of gold on the Witwatersrand in 1886. This resulted in the transformation of a rural pastoral economy to a modern industrial economy by the 1950s. Rapid urbanization occurred during this period.

The most densely populated parts of South Africa are the four major industrial areas, the Pretoria–Witwatersrand–Vereniging (PWV) area, the Durban–Pinetown–Pietermaritzburg area, the south-western Cape, and the Port Elizabeth–Uitenhage area. About one-third of the country's total population of about 36 million lives in these four regions.

Council for Scientific and Industrial Research

The CSIR, the leading South African science and technology research and development organization,

New President of the Applied Chemistry Division

At the 36th IUPAC General Assembly held in Hamburg, August 1991, Dr Piet Steyn succeeded Dr Lewis Coles as President of IUPAC's Applied Chemistry Division. Steyn is Director of the CSIR Division of Food Science and Technology.

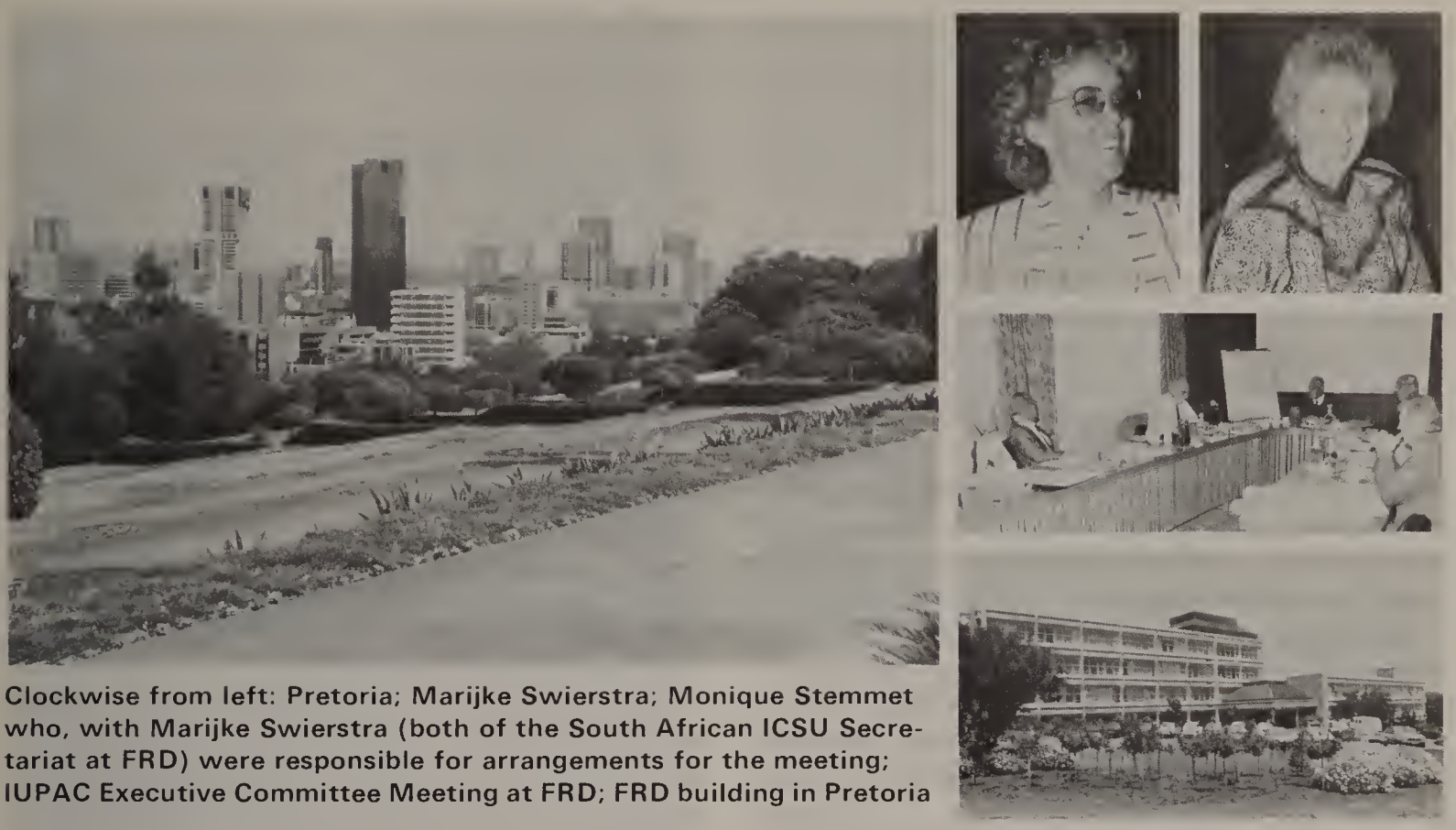
Steyn has devoted his research career to the isolation, analysis, structure elucidation and biosynthesis of mycotoxins. Much of the research has been carried out in collaboration with fellow scientists across the world and has formed the substance of 160 scientific papers and reviews.

He has served on the Executive Committee of the Council of the South African Council for Natural Scientists and was President of the Joint Council of Scientific Societies.

Since 1973, he has been a member of the South African delegation to IUPAC general assemblies and has served as the Vice-Chairman of the IUPAC Commission on Food Chemistry. He was elected to the Applied Chemistry Division Committee in 1987 and became Vice-President of the International Association for Cereal Science and Technology (ICC) in 1990. He will be President of ICC from June 1992 to May 1994.

Steyn was Head of the Organic Chemistry Division of the former National Chemical Research Laboratory prior to his appointment in 1986 as Chief Director of the former National Food Research Institute. He was appointed Director of the Division of Food Science and Technology in 1987.

Dr Piet Steyn and CSIR complex



Clockwise from left: Pretoria; Marijke Swierstra; Monique Stemmet who, with Marijke Swierstra (both of the South African ICSU Secretariat at FRD) were responsible for arrangements for the meeting; IUPAC Executive Committee Meeting at FRD; FRD building in Pretoria

- is the largest R&D organization in Africa, employing a staff of some 3700 scientists, engineers and support staff,
- performs between 12 and 15% of all research and development work conducted on the African continent,
- funds approximately 55% of its R&D from contract income, royalties and licensing agreements.

The organization, which was established in 1945 by an Act of Parliament, initiated a process of corporate restructuring in 1986 to change from a government-sponsored R&D facility into a market-orientated, autonomous corporation.

The CSIR today, in addition to developing relevant technology itself, is a funnel through which First World international technologies are channelled into South and Southern Africa. At the same time, the organization acts as a technology bridge for the transfer of scientific and technological advances to Southern Africa and to the continent as a whole.

In South Africa's rapidly changing society, the biggest challenge facing the CSIR is to strike a balance between leading-edge technological R&D and addressing those needs of the country's rural and urban developing communities where appropriate technology can play a special role.

CSIR is therefore committed to improving the quality of life of the community and at the same time positioned to help build an export-orientated manufacturing sector. The Council operates in three major areas: it uses science and technology to (1) enhance the international competitiveness of the private sector; (2) to provide decision support to the public sector; (3) to improve the quality of life in developing urban and rural communities.

The 13 CSIR divisions reflect the broad scope and depth of its R&D activities. They cover: aeronautical systems technology; building technology; earth, marine and atmospheric science and technology; energy technology; food science and technology; forest science and technology; information services; materials science and technology; microelectronics and communications technology; production technology; roads and transport technology; textile technology; and water technology.

Chemical R&D forms an inherent part of the CSIR's activities in the fields of materials research, energy, the environment, food, water, timber, textile and building technology. A few of its recent achievements in chemistry include:

- world leadership in the study of mycotoxins and the creation of analytical standards for national and international use;
- the successful manufacture, in a joint venture with the Anglo American Corporation, of a low-cost rechargeable battery, which in its simplest state contains iron and common salt, and which delivers about five times the specific energy of conventional lead–acid batteries;
- the development of a process for the safe manufacture of osmium tetroxide — a very valuable but extremely poisonous compound.

Foundation for Research Development

The 1991 meeting of the IUPAC Executive Committee took place for two days in May in Pretoria, administrative capital of South Africa, at the offices of the Federation for Research Development (FRD). FRD is the National Adhering Organization to ICSU (International

Council of Scientific Unions) and IUPAC. The South African Secretariat for ICSU is also located at FRD.

The Foundation is structured to support South Africa's interest through the promotion of science and technology in the country and focuses on the training of high-level manpower at universities, technikons and museums.

FRD was established in 1984 as a CSIR group activity. On 1st October 1990, FRD started operating as an independent statutory body, under the control of its own Council. Priority themes of FRD are: (1) Enabling Technologies (electronics, information, materials, energy, manufacturing and minerals) and (2) Environmental Sciences and Technologies (global climatic change, water resources, conservation biology, ocean and coastal zone, biotechnology, agriculture and related fields).

FRD operates certain national research facilities which offer opportunities for advanced training in a variety of scientific and technological disciplines. It also provides bursaries to technikon and university students at all levels and grants to programme leaders at universities and technikons.

New FRD initiatives include 'Science and Maths 2001' — school projects designed to enhance science and mathematics literacy and appreciation. Another initiative has targeted grants to individuals at universities to stimulate an interest in science and technology amongst black students and create research and study opportunities for both staff and students. Increasing emphasis is being placed on young scientists and technologists in the allocation of FRD funds. Special funding categories for outstanding and promising researchers, younger than 35 years, have been introduced to ensure that they are offered the opportunity to realize their full potential.

Affiliate Membership Programme in South Africa

The Affiliate Membership Programme in South Africa was launched in 1987 by the South African Chemical Institute (SACI). The number of South African chemists registering that year was 240. In 1991 the number was 268.

At a reception during the Executive Committee meeting in Pretoria, SACI President, Prof. Anton Heyns (University of Pretoria) pointed out that about 14% of the total SACI membership had registered as affiliates. This remarkably high percentage indicates the strength of the links between IUPAC and chemists in South Africa.

Mintek

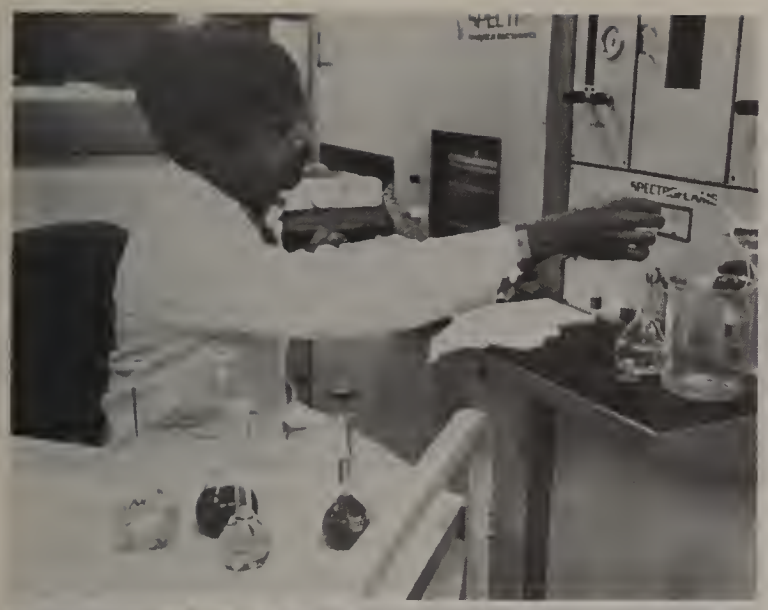
The Council for Mineral Technology (Mintek) is a statutory organization financed largely by the state. Its primary aim is to promote mineral technology, including research into the properties, composition, recovery, extraction, processing, refining and utilization of minerals and mineral products. Mintek places particular emphasis on technology transfer, and continually monitors the current and future needs of industry.

Its prime objectives are twofold: firstly, the traditional one of improving technology and finding ways of maintaining South Africa's competitive edge in world mineral markets through technical cost-cutting innovations; secondly, of growing importance in Mintek's range of activities is research and development into added value processes and operations, prompted by the urgent need to increase the earnings from South Africa's mineral resources by turning them into products of higher (added) value before they are exported.

Mintek is organized into eight scientific and engineering divisions as well as three support divisions.

The importance of gold as South Africa's single most valuable commodity is reflected in the fact that some 20% of Mintek's research effort is still devoted to various aspects of gold metallurgy. The most recent notable success has been the development of the Carbon-in-Pulp Process.

From left: Prof. Mac Zulu (University of Zululand) is South African National Representative on the IUPAC Commission on Nomenclature of Inorganic Chemistry. SACI President Prof. Anton Heyns (University of Pretoria) and Miss E. Tsimas (SACI) who is responsible for the day-to-day operation of the affiliate membership programme in South Africa



ICP (inductively coupled plasma) emission spectroscopy at MINTEK (above) and conveyer belts moving platinum ore at the Rustenburg Platinum Mine (below)

Sasol

South Africa is a country which is rich in coal but lacking in oilfields. The South African Coal, Oil and Gas Corporation (today known as Sasol) was founded in 1950 to promote the commercialization of fuel synthesis. Its establishment was government-funded through the Industrial Development Corporation.

Extensive research on the oil-from-coal process followed, aimed at improving the plant's cost efficiency. Vast changes were implemented and on acquiring the right to the fluid-bed process in 1972, the Sasol Synthol Process was born.

During the sixties, Sasol became a major supplier of raw materials for the chemical industry. These included materials such as solvents for paints, butadiene and styrene for synthetic rubber, ammonia for nitrogenous fertilizers, and ethylene for plastics and other industries.

Sasol's first naphtha-cracker became operational in 1965. The decision to refine imported crude oil was made in 1966. This led to the establishment of National Petroleum Refiners of South Africa 3 years later.

The OPEC oil-crisis of the early seventies further enhanced the market for synfuels. To cope wtih increased demand, a second Sasol plant was commissioned in the South-Eastern Transvaal. Construction commenced in 1976 and the first oil was produced 4 years later in 1980. The construction of Sasol Three, a plant of equal size adjacent to Sasol Two, started in 1979.

The Sasol process (a combination of the German fixed-bed and the American fluid-bed Fischer–Tropsch processes) has become a blueprint for synthetic fuel projects in South Africa and around the world.

South Africa is dependent on imported crude for only a minor part of its energy requirements. The balance is met by indigenous sources — primarily coal.

Sasol independently operates its own coal mines. The Sasol Collieries at Secunda and Sasolburg produce 36 million tons of coal per year for Sasol One, Two and Three. These collieries have extensive coal reserves, sufficient to meet the foreseeable needs of the Sasol Group until at least the middle of the next century.

One of the great advantages of the Fischer–Tropsch process is its versatility. Depending on market trends, the end-products can be varied from maximum volume liquid fuels to a combination of fuels and chemical products. Some 80 non-fuel products were marketed by Sasol in 1980, some of which went to 50 countries world-wide.

The Sasol Synthol Process

The Sasol Synthol Process consists of the following steps.

1. Coal is sized and screened. Fine coal is burnt to generate steam. Coarse coal is fed to gasifiers with steam and oxygen (supplied by air separation plants).
2. At a pressure of 30 atmospheres, gasified coal, steam and oxygen are converted to an optimum H_2 : CO ratio together with CH_4, N_2, H_2S, NH_3, oil and tars. Water condenses from the cooled gas and soluble components and heavy hydrocarbons go to the gas/liquor separation unit and refineries.
3. CO_2 and H_2S are removed as 'sour gas' from the cooled gas using methanol absorption. Sulfur is recovered from the sour gas and converted to H_2SO_4 for the manufacture of phosphate fertilizers. The CO_2 is released. Crude phenol and NH_3 are recovered from the gas liquids. High value phenols and cresylics are refined from the crude phenol. Nitrogenous fertilizers are produced from the NH_3, HNO_3 and NH_4NO_3.
4. The purified synthesis gas (syngas) is converted to hydrocarbons and oxygenated compounds by the exothermic Fischer–Tropsch reaction using a powdered iron-based catalyst.

The Sasol Two Factory (left) at Secunda on the Eastern Transvaal Highveld of South Africa. Collectively Sasol Two and its sister plant Sasol Three cover 13 km^2. A scientist (right) from Sasol's Research and Development department investigates the properties of catalysts with use of an electron microscope

5. Condensation products comprise gas, liquid hydrocarbons and an aqueous mixture. The hydrocarbon liquid is refined to motor fuels. Acetone, methylethyl ketone, ethanol and higher alcohols are recovered from the aqueous strream. Most of the alcohol is used for high octane blends of gasoline and the rest marketed for use in rubber, solvents, and so on.
6. Unconverted H_2 and CO are separated from the hydrocarbons. Further processing produces petrol, diesel, low pressure gas, jet fuel and small amounts of fuel oil. Methane is either marketed as a substitute for natural gas or reformed to produce H_2 and CO as additional feed for the synthol process. Ethane and ethylene are refined to produce pure ethylene or reformed for the Synthol process. Propylene is polymerized to polypropylene or oligomerized to produce diesel.
7. The tar and oil products are upgraded to become petrol and diesel blend components. Phenols are extracted from the aqueous portion. Further treatment of the aqueous effluent yields commercial anhydrous ammonia.

UNISA

The University of South Africa (UNISA) started in 1873 as the University of the Cape of Good Hope. It was purely an examining body for other institutions. In 1946 UNISA was formed as a distance teaching university and teaching takes place mainly through the medium of the printed word. UNISA thus became the first university in the world to offer distance teaching at a tertiary level, a method which is increasingly being adopted throughout the world today.

The university has six faculties (Arts, Commerce and Management Sciences, Education, Law, Science and Theology) and offers more than 2160 courses in 57 academic departments.

In 1989, its 108 372 registered students represented approximately 40% of South Africa's total university student body. Forty-seven per cent of the student body are women. The average age is 31 years, the youngest being 17 and the oldest 84. Eighty-nine per cent of the students are resident in South Africa, more than 11 000 live in the remainder of Africa and 798 students live abroad. Examinations are written in more than 405 centres throughout the country and in some 45 centres in 31 countries beyond South Africa's borders.

UNISA and two IUPAC affiliate members of its Chemistry Department: Prof. George McGillivray (left) who is Head of Department and Prof. Bob Hasty

UNISA has its own printing facilities where 408 million A5 pages of tutorial matter and other items were produced last year, using 700 tons of paper.

UNISA serves the whole country and all its peoples, transcending geographical and cultural barriers, without physically drawing its students to one campus.

IUPAC affiliates: Jack Elsworth (left) and James Bull (centre) both of UCT and David Schneider (University of Stellenbosch)

Cape Town

Following the Executive Committee meeting in Pretoria and visits to Sasol, MINTEK and UNISA (see above), your roving Editor travelled to Cape Town where he visited the Universities of Cape Town (UCT), Western Cape (UWC) and Stellenbosch. At UWC he met Prof. Ivan Green and at the University of Stellenbosch, IUPAC affiliate Prof. David Schneider.

At UCT, IUPAC affiliate James Bull is Mally Professor of Organic Chemistry. His research interests centre largely on the themes of predictive synthetic design and structure–activity relationships of bioactive molecules, with an emphasis on steroidal hormones. The purpose is to identify those molecular and topological characteristics which give rise to selective hormonal responses, and hence to design new approaches to synthesis of potentially useful hormones. Recent developments in this programme include the synthesis of new compounds displaying superior oral estrogenicity. In practice, the programme entails total and partial synthesis of structurally modified steroidal hormones, and the study of their conformational properties with the aid of spectroscopic, crystallographic, and molecular mechanics methods.

Bull became involved with the work of IUPAC in 1983 and has been a Titular Member of the Commission on Nomenclature of Organic Chemistry and a Member of the International Union of Biochemistry (IUB) — IUPAC Joint Commission on Biochemical Nomenclature. He was President of SACI from 1986 to 1988.

Emeritus Professor Harry Irving, now retired from the Chair of Analytical Science at UCT, made significant contributions to the work of IUPAC. For example, in 1978 he was the author or co-author of the following IUPAC publications.

- Recommendations on the usage of the terms 'equivalent' and 'normal' (with T. S. West and D. H. Whiffen: *PAC*, Vol. 50, pp. 325–338, 1978)
- Guide to trivial names, trade names and synonyms for substances used in analytical chemistry (*PAC*, Vol. 50, pp. 339–370, 1978)
- Coordination compounds in analytical chemistry (Plenary lecture, 18th International Conference on Coordination Chemistry, São Paolo, Brazil: *PAC*, Vol. 50, pp. 1129–1146, 1978)
- *Compendium of Analytical Nomenclature* — the first Orange Book — (with H. Freiser and T. S. West, Pergamon Press, Oxford, 1978).

Harry Irving's wife Anne is a Senior Lecturer at UCT. Apart from work on metal-ligand complexes, the main thrust of her research work is the preparation, structure and conformation of oxygen and/or sulfur containing heterocycles.

IUPAC affiliate Bill Campbell is also a Senior Lecturer at UCT. His research interests involve the phytochemical study of plant species from the families Ameryllidaceae, Apiaceae and Rutaceae.

IUPAC affiliate and UCT Associate Professor Graham Jackson's research interests centre largely on metal-ion speciation in biofluids with particular emphasis on blood plasma and natural waters. Peter Linder, Professor of Physical Chemistry and an IUPAC affiliate shares this interest. Linder's research work concerns metal complex equilibria in aqueous systems of varying complexity. His group has applied potentiometry, calorimetry, NMR and spectrophotometry to investigate single metal-single ligand systems. Examples include simple systems such as zinc(II)–levulinic acid as well as complicated systems such as copper(II)–methyldopa. Methyldopa is used in medicine as an anti-hypertensive agent.

Linder is also interested in applying the results obtained for single metal–single ligand systems to the construction of computer models of multicomponent fluids containing varieties of metal ion species and ligands, for example: (1) determining the distribution of low molecular mass metal complexes in blood plasma; (2) predicting conditions for the precipitation of kidney stone-forming solids from urine; (3) determining the speciation of essential micronutrient trace metals and toxic metals in plant nutrient solutions and soils; (4) investigating trace metal speciation in sea water.

Klaus Koch is an Associate Professor at UCT and an IUPAC affiliate. His research interests encompass several areas: multinuclear NMR spectroscopy; extraction of platinum group metals; flow injection analysis; and coordination chemistry.

Students at the University of Stellenbosch (left) UWC (centre) and in a UCT undergraduate chemistry teaching laboratory

Analytical chemistry in the exploration, mining, and processing of materials

The IUPAC-sponsored 3rd International Symposium on Analytical Chemistry in the Exploration, Mining, and Processing of Materials will be held at the Sandton Sun Hotel, Sandton, South Africa, on 2–7 August 1992.

Analytical chemistry is of vital importance to the mining and mineral industry. It is used not only in the exploration and exploitation of mineral deposits, but also in the processing of materials. The aim of this symposium is to highlight the importance of analytical chemistry in the production of materials, from the initial stages of exploration and assessment of ores to their beneficiation and finally, to the refined product.

The technical programme will comprise plenary lectures, parallel sessions of oral presentations, and poster presentation. The general theme will be the role of contemporary chemical analysis in mining and industrial technology. The following topics will be covered.

1. Geochemical exploration
2. Extraction and beneficiation of materials
3. Value-added products
4. Environmental aspects
5. Coal
6. Metals and alloys
7. Rare earths
8. Noble and base metals
9. Analytical assurance and laboratory management
10. Automation and process control
11. High-technology materials.

The official language of the symposium will be English. No translation facilites will be available. Modern scientific instruments and books will be on display throughout the symposium.

August is a winter month in South Africa, with mild, sunny days and cool to cold evenings. The average night and day temperature range is 5–18°C.

Chairman of the Symposium Organic Committeee is Dr Vic Schüler. IUPAC affiliate Ron Mallett is Vice-Chairman and another IUPAC affiliate, Prof. C. J. Rademeyer is Chairman of the technical programme.

Please address all correspondence and enquiries to: The Symposium Secretariat, Mintek, Private Bag X3015, Randburg, 2125, Republic of South Africa. Tel: +27 (11) 793–3511 (Mrs Pam Baartmen, Miss Yvonne Arnold.) Fax: +27 (11) 793-2413. Telex: 424867 SA.

Other addresses in South Africa

- CSIR: PO Box 395, Pretoria, 0001, Republic of South Africa.
- FRD: FRD Information, PO Box 2600 Pretoria, Republic of South Africa. Tel: +27 (12) 841-3364/4280/4048. Fax: +27 (12) 841-4301. Telex: 3-21356 FRD SA
- MINTEK (see above)
- Sasol: Sasol Limited, 1 Sturdee Avenue, Rosebank, 2196, PO Box 5486, Johannesburg, 2000, Republic of South Africa. Tel: +27 (11) 441–3111. Fax: +27 (11) 788-5092. Telex: 4-26778 SA.
- UNISA: The Department of Public Relations and Development, UNISA, PO Box 392, Pretoria, 0001, Republic of South Africa. Tel: +27 (12) 429-3111. Fax: +27 (12) 429-2533. Telex: 3-50068 SA.

PAC Reviews

Pure and Applied Chemistry (PAC) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Organometallic chemistry

The June 1991 issue of *PAC* contains plenary and session lectures presented at the 14th International Conference on Organometallic Chemistry held in Detroit, USA, on 19–24 August 1990. The following are the titles of the plenary lectures.

- Stereochemistry and catalysis with zirconium complexes (Gerhard Erker — Münster, Germany)
- Theoretical aspects of metal cluster chemistry (D. Michael P. Mingos — Oxford, UK)
- Main group metallocenes with substituted cyclopentadienyl ligands: from bonding problems to discotic phases (Herbert Schumann — Berlin, Germany)
- Heterogeneous catalysis on platinum and self-assembled monolayers on metal and metal oxide surfaces (T. Randall Lee, Paul E. Laibinis, John P. Folkers, and George M. Whitesides — Harvard, USA).

One of the session lectures was given by IUPAC affiliate Tom Ziegler (University of Calgary, Canada). His lecture was entitled 'Density functional theory as a practical tool for the study of elementary reaction steps in organometallic chemistry.'

Ziegler explained that approximate density functional theory (A-DFT) is one of a growing number of theoretical models which can be used to study the dynamics and energetics of organometallic molecules. He reported A-DFT calculations on a number of M–H, M–CH_3 and M–CO bond dissociation energies which were in good agreement with experiment. Geometries optimized by the same method compared favourably with observations. Finally, Ziegler showed how the method can trace the reaction profiles of elementary reaction steps in organometallic processes.

Solar synthesis

Several IUPAC affiliates contributed to the 33rd International Symposium on Macromolecules (MACRO90) held in Montreal, Canada, 8–13 July 1990. They included James Guillet (University of Toronto, Canada) who presented a plenary lecture on 'Prospects of solar synthesis.'

In his paper, published with four other plenary lectures in the July 1991 issue of *PAC*, he pointed out that natural sunlight is a powerful source of energy to carry out useful chemical reactions. Polymers can be designed to control and catalyse important photochemical processes such as 'artificial photosynthesis,' production of hydrogen peroxide, and removal of water contaminants such as polynuclear aromatics (PNAs) and polychlorinated biphenyls (PCBs). His paper describes preliminary explorations of ways to use the world's most abundant source of energy to power novel chemical processes by employing simple polymeric devices.

Affiliate Eric Baer was one of three scientists from Case Western Reserve University, USA, who contributed a paper on 'Hierarchical structure of collagen composite systems: lessons from biology.'

In the abstract of their paper, they state that hierarchical structure in biocomposite systems, such as in collagenous connective tissue, have many scales or levels, have highly specific interactions between these levels, and have the architecture to accommodate a complex spectrum of property requirements. Their paper describes the hierarchical structure–property relationships in three soft connective tissues (tendon, intestine and intervertebral disc) as examples.

In all instances, the three authors observed numerous levels of organization with highly specific interconnectivity and with unique architectures designed to give the required spectrum of properties for each oriented composite system. From these lessons in biology, they considered the laws of complex composite systems for functional macromolecular assemblies. Finally, their paper demonstrates the application of these laws to simple synthetic composites including continuous multilayed polymeric materials, liquid crystalline polymers and 'hard elastic' membranes. The paper shows that structure–property relationships can only be described, and in some instances predicted, if these complex synthetic materials are accurately defined in terms of their hierarchical structure.

Another affiliate, Richard S. Stein (University of Massachusetts, USA) delivered a lecture on 'Some scattering studies of polymer microstructures, surfaces, and interfaces.' His lecture discussed the use

of light, X-ray, and neutron scattering and reflection techniques for the study of the structure of polymers in their solid state for polyethylene blends, liquid-crystal polymers, and surface enrichment in polystyrene.

For the polyethylene blends, Stein demonstrated the role of one component in affecting the crystallization kinetics and morphology of the second. He also discussed the importance of texture coarsening accompanying disclination annihilation with liquid-crystal polymers. He showed differences in surface and bulk concentration as affected by composition and molecular weight for polystyrene blends.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions will be published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports.

Nomenclature of regular double-strand (ladder and spiro) organic polymers

Structure-based and source-based nomenclature rules are extended to regular double-strand (ladder and spiro) organic polymers. Recommendations for naming regular single-strand polymers have been published previously. A double-strand polymer is defined as a polymer whose molecules are formed by an uninterrupted sequence of rings with adjacent rings having one atom in common (spiro polymers) or two or more atoms in common (ladder polymers). The structure-based nomenclature rests upon the selection of a preferred constitutional repeating unit (CRU) of which the polymer is a multiple. Factors taken into consideration are in decreasing order of priority: minimization of the number of free valences of the CRU, maximization of the number of most preferred hetero atoms in the ring system, retaining the most preferred ring system, and choosing the longest chain for an acrylic CRU. Prior to naming the polymer, the CRU is oriented and named according to the established principles of organic nomenclature for naming bivalent and multivalent groups. Rules are provided for denoting substituents and end groups. The source-based nomenclature identifies the starting monomer(s) from which the double-strand polymer is prepared with addition of an appropriate prefix '*ladder-*' or '*spiro-*'.

Comments on the document are welcome and should be sent by 31 August 1992 to: Dr W. V. Metanomski, Chemical Abstracts Services, POB 3012, 2540 Olentangy River Road, Columbus, OH 43210, USA.

Nomenclature and terminology of graphite intercalation compounds

Covalent graphite compounds, i.e. graphite fluoride and graphite oxide, should be distinguished from graphite intercalation compounds in which layers of the intercalated substance are inserted between planar carbon sheets of the graphite structure with concomitant charge transfer.

Particular to graphite intercalation compounds is their tendency to form periodically stacked high-stage compounds in which only a fraction of the interlayer spaces of the graphite host lattice is filled with intercalated layers. The stage number is defined by the ratio of the total number of interlayer spaces to the number of filled interlayer spaces. Donor and acceptor compounds are differentiated by the direction of the electron transfer to or from the carbon layers, respectively.

In naming a graphite intercalation compound, the intercalated element or compound precedes the word graphite, whilst the electropositive constituent is written first in the formula. The stage number is added in parentheses to the name or formula. Often, the space between intercalated ions is filled with solvent molecules; in this case the name or formula of the solvent compound is inserted after that of the electropositive constituent, otherwise it is added after that of the intercalated species.

Graphite intercalation compounds are non-stoichiometric; this fact should be taken into account in their formulation. Binary (ternary, etc.) intercalation compounds contain one (two, etc.) chemical species in addition to graphite; free acids and their anions are taken as one chemical species. In bi-intercalation compounds two different chemical species are inserted in separate interlayer spaces. Rules for structural notation follow those used in the description of polytypes of metal dichalcogenides. Suggestions are presented for the symbols to be used for interlayer spacings, thicknesses of intercalated layers, etc.

Comments on the document are welcome and should be sent by 31 August 1992 to: Dr H. P. Boehm, Institute für Anorganische Chemie der Universität, Meiserstraße 1, D-8000 München 2, Germany.

Addresses of National and Regional Centres

If you would like to comment on provisional recommendations please write to your nearest national and regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of national and regional centres is shown below.

Argentina
Dr J. M. Barnett
Director, Indústria y Química
Asociación Química Argentina
Sánchez de Bustamante 1749
Buenos Aires
Argentina

Asia (Australia, Bangladesh, Hong Kong, Indonesia, Iraq, Korea, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Thailand)
Professor Sang up Choi
c/o Korean Chemical Society
35 5 — KA Anam Dong
Sungbuk-ku
Seoul 136-075
Republic of Korea

Bulgaria
Professor O. Peshev
Bulgarian Academy of Sciences
Institute of General and
Inorganic Chemistry
Sofia 1040 Bulgaria

Canada
Professor J. ApSimon
Director of Research Dean
Faculty of Graduate Studies
and Research
Room 1525, Dunton Tower
Carleton University
Ottawa, Canada K1S 5B6

China/Beijing
Dr Xibai Qui
Chinese Chemical Society
POB 2709
Beijing
China

China/Taiwan
Professor F. C. Chen
Department of Chemistry
National Taiwan University
POB 30-373
Taiwan

Czechoslovakia
Dr J. Kahovec
Ústav makromolekulární chemie
Ceskosolvenská nám 2
CS-16206 Prague 616
Czechoslovakia

France
Prof. Françoise Rouquérol
CTM–CNRS
26 rue du 141e RIA
13003 Marseille
France

Germany
Dr Eva Wille
Journal Department Manager
VCH Verlagsgesselschaft
Postfach 1260/1280,
D-W 6940 Weinheim
Germany

Hungary
Professor E. Pungor
Altalános és Analitikai Kémiai
Tanszék
Budapesti Müszaki Egyetem
Gellért tér 4
H-1521 Budapest XI
Hungary

India
Dr V. C. Vora
Indian National Science Academy
Bahadur Shah Zafar Marg
New Delhi 110002
India

Italy
Professor G. Scorrano
President Società Chimica Italiana
00128 Roma
Viale Liege 48
Italy

Japan
Dr A. Nakanishi
Executive Director
Chemical Society of Japan
1–5 Kanda Surugadai
Chiyada-ku,
Tokyo 101
Japan

The Netherlands
Ir E. J. Ryck van der Gracht
Koninklijke Nederlandse Chemische
Vereniging
Postbus 90613
2509 LP den Haag
The Netherlands

Poland
Professor O. Achmatowicz
Institute of Chemistry
Warsaw Agricultural University
Rakowiecka 26/30
02-528 Warsaw
Poland

Sweden
Dr K. Samuelsson
TCO-Tjänstedata AB
Tunnelgatan 17
S-105 32 Stockholm
Sweden

Republic of South Africa
Professor J. R. Bull
Department of Organic Chemistry
University of Cape Town
Rondebosch 7700
Republic of South Africa

UK
Dr A. D. McNaught
The Royal Society of Chemistry
Thomas Graham House
Science Park, Milton Road
Cambridge, CB4 4WF
UK

USA
Dr Marianne Brogan
Journals Department
American Chemical Society
2540 Olentangy River Road
POB 3330 Columbus
Ohio 43210
USA

USSR
Professor G. B. Bokij
Commission on Nomenclature
National Committee of Soviet
Chemists
Academy of Sciences of USSR
Kosygin Street 4
SU-1176 977 Moscow V-334
USSR

Recent Reports

Determination of mono- and diglycerides by capillary gas chromatography

A method for the determination of mono- and diglycerides by capillary gas chromatography has been elaborated and tested in a collaborative study. The procedure involves conversion of the mono- and diglycerides into more-volatile trimethylsilyl ether derivatives using *N,N*-bis(trimethylsilyl)trifluoroacetamide (BSTFA) and trimethylchlorosilane (TMCS) (3:1) in pyridine. *n*-Tetradecane was used as an internal standard. Capillary gas chromatography with split or on-column injection was applied.

The samples analysed consisted of two commercial mono-, diglyceride emulsifiers, two mixtures of known composition of mono- and diglycerides present in an excess of triglycerides, and of refined sunflower oil spiked with known amounts of mono- and diglycerides.

Besides mono- and diglycerides other components of fats and oils such as glycerol, fatty acids, sterols, etc. may be converted into the trimethylsilyl ether derivatives and analysed by the same GC procedure. To identify components, coupled gas chromatography/mass spectrometry is advantageous.

This report of the results of a collaborative study and the standardized method was prepared for publication by H. Brüschweiler and A. Dieffenbacher, the Commission on Oils, Fats and Derivatives, Applied Chemistry Division, and published in PAC, *Vol. 63, No. 8, pp. 1153–1162.*

Determination of polymerized triglycerides in oils and fats by high-performance liquid chromatography

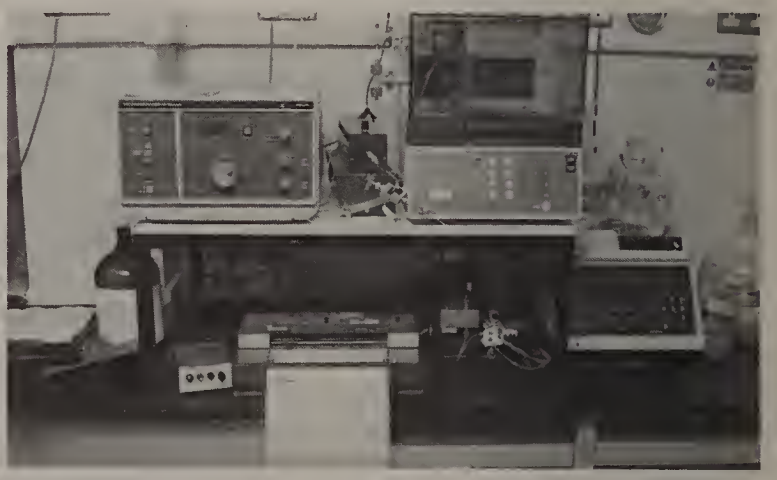
A description is given of the development by collaborative study of a standardized method for the determination of polymerized triglycerides in oils and fats by gel permeation HPLC. This rapid procedure allows the determination of polymer contents equal to or higher than 3% (w/w) of the total amount of fats.

This report of the results of a collaborative study and the standardized method was prepared for publication by J. P. Wolff, F. X. Mordret and A. Dieffenbacher, the Commission on Oils, Fats and Derivatives, Applied Chemistry Division, and published in PAC, *Vol. 63, No. 8, pp. 1163–1171, 1991*

Determination of triglycerides in vegetable oils in terms of their partition numbers by high-performance liquid chromatography

The development by collaborative study of a standardized method for the determination of composition of triglycerides in vegetable oils in terms of their partition numbers (or equivalent carbon numbers: *ECN*) by high-performance liquid chromatography is described. The procedure involves the preparation of an oil sample solution, the injection in the HPLC chromatograph, the separation of triglycerides using a reversed-phase polarity column and detection with an appropriate system (e.g. refractive index detector). The method allows separation of triglycerides into groups of identical partition numbers and the calculation of their relative contents.

This report of the results of a collaborative study and the standardized method was prepared for publication by J. P. Wolff, F. X. Mordret and A. Dieffenbacher, the Commission on Oils, Fats and Derivatives, Applied Chemistry Division, and published in PAC, *Vol. 63, No. 8, pp. 1173–1182, 1991.*



Two IUPAC reports have recently been published on the use of HPLC to determine triglycerides in oils and fats. (*Photo courtesy Lilly Industries*)

Determination of lead in oils and fats by direct graphite furnace atomic absorption spectrometry

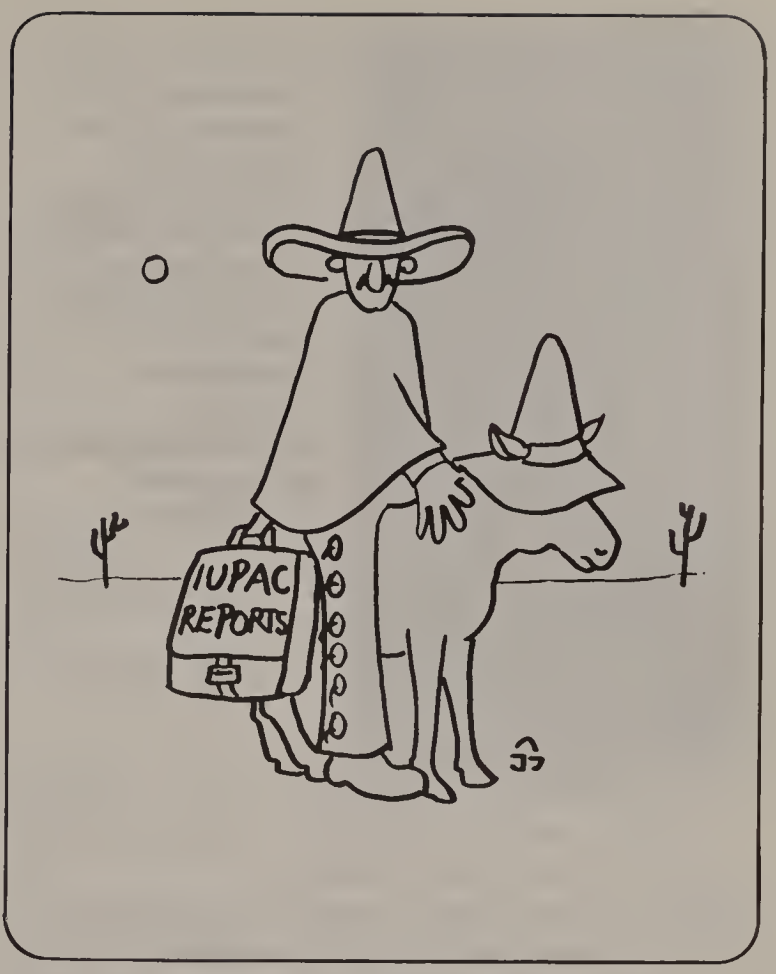
A description is given of the development by collaborative study of a standardized method for the determination of lead in oils and fats by direct graphite furnace atomic absorption spectrometry. The procedure is both rapid and sensitive allowing determination at levels of 0.01–0.1 mg/kg.

This report of the results of a collaborative study and the standardized method was prepared for publication by P. W. Hendrikse, F. J. Slikkerveer, A. Folkersma and A. Dieffenbacher, the Commission on Oils, Fats and Derivatives, Applied Chemistry Division, and published in PAC, *Vol. 63, No. 8, pp. 1183–1190, 1991.*

Determination of phosphorus in oils and fats by direct graphite furnace atomic absorption spectrometry

A description is given of the development by collaborative study of a standardized method for the determination of phosphorus in crude and refined oils and fats by direct graphite furnace atomic absorption spectrometry. The procedure is rapid and allows determination at levels of 1–100 mg/kg.

This report of the results of a collaborative study and the standardized methods was prepared for publication by P. W. Hendrikse and A. Dieffenbacher, the Commission on Oils, Fats and Derivatives, Applied Chemistry Division, and published in PAC, *Vol. 63, No. 8, pp. 1191–1198, 1991.*



Publications

Measurement of the transport properties of fluids

For several decades the Commission on Thermodynamics and Thermochemistry, now renamed the Commission on Thermodynamics, has pursued an active role in the definition and maintenance of standards in the fields encompassed by its title. This role includes, but is not limited to, the establishment and surveillance of international pressure and temperature scales, recommendations for calorimetric procedures, the selection and evaluation of reference standards for thermodynamic-measurement procedures of all types and the standardization of nomenclature and symbols in chemical thermodynamics. Through its Sub-committees on Thermodynamic Data and on Transport Properties, the Commission is also responsible for the dissemination of internationally approved thermodynamic tables of the fluid state and representations of the transport properties of fluids.

Over the years the Commission has also been responsible for the production of three series of books summarizing the state of knowledge with respect to experimental techniques in thermodynamics and thermochemistry. Most recently, a text entitled *Combustion Calorimetry*, edited by S. Sunner and M. Mænsonn, was issued (Pergamon, Oxford) in the series 'Experimental Chemical Thermodynamics'.

Earlier, the Commission had undertaken the creation of two books in the series 'Experimental Thermochemistry'. The first appeared in 1956 (Interscience Publishers, Inc., New York) under the editorship of F. D. Rossini and the second in 1962 (Interscience-Wiley, New York) edited by H. A. Skinner. In the third series of 'Experimental Thermodynamics' two volumes have already been produced both dealing with thermodynamic measurements in non-reacting systems. The first book in this series was *Calorimetry of Non-Reacting Systems*, edited by J. P. McCullough and D. W. Scott (Butterworths, London) published in 1968. The second book in the series *Experimental Thermodynamics of Non-Reacting systems*, edited by B. Le Neindre and B. Vodar, published in 1975 (Butterworths, London), was concerned with the measurement of a broader range of thermodynamic and calorimetric properties over a wide range of conditions.

Measurement of the transport properties of fluids: Experimental thermodynamics. Volume III is No. 37 in the IUPAC Chemical Data Series. This latest volume continues the theme of the two earlier volumes in the series 'Experimental Thermodynamics' by considering non-reacting systems. However, on this occasion at-

A modern commercial digital viscometer. Volume III in the Experimental Thermodynamics series has chapters on: oscillating-body viscometers; capillary viscometers; vibrating viscometers; and falling-body viscometers.

tention is concentrated upon the measurement of properties characteristic of the relaxation of a fluid from a non-equilibrium state: the transport properties.

The topic was conceived by the Commission on Thermodynamics in 1987 and the editors assigned the task of assembling an international team of experts to describe the current state of development of the techniques of measurement of the transport properties of fluids and their mixtures including viscosity, thermal conductivity, diffusion coefficients, thermal–diffusion factors and thermal–transpiration coefficients. Naturally, many of the team were found among the Commission's own Sub-committee on Transport Properties, but appropriate expertise from elsewhere was also sought. The volume fulfils the brief given to the editors and contains a valuable summary of a large variety of experimental techniques applicable over a wide range of thermodynamic states — always with the emphasis on the precision and accuracy of the result obtained which is so much part of the remit of the Commission on Thermodynamics itself.

Reliable information on the thermophysical properties of substances is important for science and industry. First, there are many fluids and fluid mixtures for which there are only very limited experimental thermophysical property data. This is particularly the case when new working fluids (e.g. alternative refrigerants) are to be evaluated for application. Furthermore, existing databases are often unreliable, particularly for extreme conditions of temperature and pressure and in the critical region. Even when recommended methods for calculating thermophysical properties based on the best experimental information are available, problems may become apparent when new or improved experimental methods for measuring thermophysical properties are developed.

The history of the information available for the viscosity of gases at high temperatures provides an illustrative example. Many of the data books on the viscosity of gases at elevated temperatures are still based on experimental measurements made by Trautz and co-workers, which had been considered for many years as the best data. However, more recent studies have shown these data to have systematic errors at temperatures above 400 K becoming as large as 10% at 1000 K. Another example is the thermal conductivity of toluene, the primary standard for the thermal conductivity of liquids, the value of which has changed by as much as 15% over half a century so that the value has only recently converged.

Of course, it is impossible to measure the thermophysical properties of all fluids and fluid mixtures over all ranges of temperature, pressure and composition. Hence, the development of databases must be accompanied by the development of theoretical models which in turn need to be tested against accurate experimental data of representative fluids and fluid mixtures.

Experimental investigations to measure transport properties involve a number of difficulties not encountered in experimental thermostatics. These difficulties arise from the necessity of bringing the system out of thermodynamic equilibrium. The transport coefficients specify the relationships between gradients of the state variables such as temperature, pressure or composition and the corresponding fluxes. However, these fluxes appear in the hydrodynamic equations which are coupled, in general, and which contain additional non-linear terms. As a consequence the actual response of the system to the presence of a finite gradient usually induces not only thermal conduction but also leads to convection and radiation. Pressure gradients, in general, not only induce laminar flow, but also secondary flow and energy dissipation. To measure transport properties the gradients have to be large enough to be measurable with sufficient accuracy, but small enough so that accompanying disturbing phenomena remain small. Moreoever, the conditions must be such that an accurate working equation is available to relate the experimentally observed quantities to the desired coefficient.

The specific purpose of this volume is to serve as a guide to the scientist or technician who is contemplating measurements of the transport properties of fluids. Emphasis is placed on those methods for which good theoretically based working equations are available or which have a good potential for industrial application. The volume will also be of interest to the data evaluator who needs to make an assessment of the reliability of experimental data obtained with a specific method.

Measuring transport properties implies, of course, the requirement for measuring temperature, pressure and density. The issues related to the measurement of temperature, pressure and density have been adequately dealt with in the previous volumes of this

series. An exception is thermometry at ultra-low temperatures where spectacular advances have been made in recent years. A section on thermometry at ultra-low temperatures is therefore included.

The volume deals with viscosity, thermal conductivity, thermal diffusivity, mass diffusion and thermal diffusion for which sufficiently validated measuring methods are available. This volume updates an earlier and more limited survey made by Kestin and Wakeham.

[The above description of this volume is based on the Foreward by G. Somsen (Past-Chairman) and P. A. G. O'Hare (Chairman) of the Commission on Thermodynamics and also on the Introduction to the book.]

Measurement of the transport properties of fluids: Experimental thermodynamics, Volume III *is edited by W. A. Wakeham, A. Nagashima and J. V. Sengers and published by Blackwell Scientific Publications, Oxford, UK, 1991. xx + 459 pp. ISBN 0-632-02997-8. Price GBP 75.00. Affiliates are entitled to a 25% discount.*

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*.

February 1991 issue of *ISO Bulletin*

TC20	**Aircraft and space vehicles**
ISO 9938: 1990	Aerospace — Polytetrafluoroethylene (PTFE) hose assemblies, classification 204°C/28 000 kPa — Procurement specification
TC 28	**Petroleum products and lubricants**
ISO 5163: 1990	Motor and aviation-type fuels — Determination of knock characteristics — Motor method
ISO 5164: 1990	Motor fuels — Determination of knock characteristics — Research method
ISO 9029: 1990	Crude petroleum — Determination of water – Distillation method
ISO 9030: 1990	Crude petroleum — Determination of water and sediment — Centrifuge method
TC33	**Refractories**
ISO 2245: 1990	Shaped insulating refractory products — Classification
ISO 10080: 1990	Refractory products — Classification of dense, shaped acid-resisting products
TC 35	**Paints and varnishes**
ISO 3710: 1990	Lead chrome green pigments — Specifications and methods of test
ISO 3711: 1990	Lead chromate pigments and lead chromatemolybdate pigments — Specifications and methods of test
ISO 4628-6: 1990	Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 6: Rating of degree of chalking by tape method
ISO 6745: 1990	Zinc phosphate pigments for paints — Specifications and methods of test
TC 45	**Rubber and rubber products**
ISO 1125: 1990	Rubber compounding ingredients — Carbon black — Determination of ash content
ISO 2475: 1990	Rubber, chloroprene (CR) — General purpose types — Evaluation procedure
ISO 4658: 1990	Rubber, acrylonitrile-butadiene (NBR) — Evaluation procedure
TC 54	**Essential oils**
ISO 3140: 1990	Oil of sweet orange [*Citrus sinensis* (Linnaeus) Obsbeck], obtained by mechanical treatment
TC 58	**Gas cylinders**
ISO 10156: 1990	Gases and gas mixtures — Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets

ISO has announced new international standards on aircraft, space vehicles, petroleum products and lubricants.

TC 61	**Plastics**
ISO 182-1: 1990	Plastics — Determination of the tendency of compounds and products based on vinyl chloride homopolymers and copolymers to evolve hydrogen chloride and any other acidic products at elevated temperatures — Part 1: Congo red methods
ISO 182-2: 1990	Plastics — Determination of the tendency of compounds and products based on vinyl chloride homopolymers and copolymers to evolve hydrogen chloride and any other acidic products at elevated temperatures — Part 2: pH method
ISO 585: 1990	Plastics — Unplasticized cellulose acetate — Determination of moisture content
ISO 1886: 1990	Reinforcement fibres — Sampling plas applicable to received batches
ISO 8256: 1990	Plastics — Determination of tensile-impact strength
ISO 8510-1: 1990	Adhesives — Peel test for a flexible-bonded-to-rigid test specimen assembly — Part 1: 90 degree peel
ISO 8510-2: 1990	Adhesives — Peel test for a flexible-bonded-to-rigid test specimen assembly — Part 2: 180 degree peel
ISO 9054: 1990	Cellular plastics, rigid — Test methods for self-skinned, high-density materials
ISO 9142: 1990	Adhesives — Guide to the selection of standard laboratory ageing conditions for testing bounded joints
ISO 9371: 1990	Plastics — Phenolic resins in the liquid state or in solution — Determination of viscosity
ISO 9944: 1990	Plastics — Phenolic resins — Determination of electrical conductivity of resin extracts
TC 85	**Nuclear energy**
ISO 7476: 1990	Determination of uranium in uranyl nitrate solutions of nuclear grade quality — Gravimetric method
ISO 9463: 1990	Nitric acid feed solutions from reprocessing plants — Spectrophotometric determination of plutonium after oxidation to plutonium(VI)
TC 138	**Plastics pipes, fitting and valves for the transport of fluids**
ISO 8795: 1990	Plastic pipes for the transport of water intended for human consumption — Extractability of constituents — Test method
TC 146	**Air quality**
ISO 8518: 1990	Workplace air — Determination of particulate lead and lead compounds — Flame atomic absorption spectrometric method
TC 147	**Water quality**
ISO 5667-6: 1990	Water quality — Sampling — part 6: Guidance on sampling of rivers and streams
TC 156	**Nickel and nickel alloys**
ISO 7530-1: 1990	Nickel alloys — Flame atomic absorption spectrometric analysis — Part 1: General requirements and sample dissolution
ISO 7530-2: 1990	Nickel alloys — Flame atomic absorption spectrometric analysis — Part 2: Determination of cobalt content
ISO 7530-3: 1990	Nickel alloys — Flame atomic absorption spectrometric analysis — Part 3: Determination of chromium content
ISO 7530-4: 1990	Nickel alloys — Flame atomic absorption spectrometric analysis — Part 4: Determination of copper content
ISO 7530-5: 1990	Nickel alloys — Flame atomic absorption spectrometric analysis — Part 5: Determination of iron content
ISO 7530-6: 1990	Nickel alloys — Flame atomic absorption spectrometric analysis — Part 6: Determination of manganese content
TC 155	**Corrosion of metals and alloys**
ISo 9227: 1990	Corrosion tests in artificial atmospheres — Salt spray tests
ISO 9400: 1990	Nickel-based alloys — Determination of resistance to intergranular corrosion
TC 159	**Ergonomics**
ISO 8996: 1990	Ergonomics — Determination of metabolic heat production
TC 171	**Micrographics and optical memories for document and image recording, storage and use**

ISO 6200: 1990	Micrographics — First generation silver-gelatin microforms of source documents — Density specifications

March 1991 issue of *ISO Bulletin*

TC 17	**Steel**
ISO 10153: 1991	Steel — Determination of boron content — Curcumin spectrophotometric method
TC 45	**Rubber and rubber products**
ISO 4660: 1991	Rubber, raw natural — Colour index test
TC 147	**Water quality**
ISO 9408: 1990	Water quality — Evaluation in an aqueous medium of the 'ultimate' aerobic biodegradaibility of organic compounds — Method by determining the oxygen demand in a closed respirometer

Safeguarding drinking water

A new International Standard sets down test methods for determining the extractability of constituents from the internal surface of plastics pipes used for carrying drinking water for human consumption.

The test method ensures that the extracted quantities of monomers; initiators; emulsifiers; emulsion stabilizers; stabilizers and antioxidants; lubricants; polymers and copolymers for blends; ultraviolet absorbers; fillers and pigments do not exceed specified limits.

ISO 8795, *Plastics pipes for the transport of water intended for human consumption — Extractability of constituents — Test method*, applies to all plastics pipes intended for the above purpose and to all constituents which are extractable by drinking water from a finished pipe. It was prepared by ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*.

The pH and the temperature of the test water and the exposure times have been choosen to cover extreme conditions.

The standard refers normatively to ISO 3696, *Water for analytical laboratory use — Specification and test methods*.

The principle of the test method consists of the prewashing of tubular test pieces for a specified time, and the filling of the test pieces with acidified or alkalified distilled water (simulated drinking water) at a fixed temperature, and the determination of the quantity of the extracted constituent after a fixed time.

The final test report should include information on the pipe sample tested, the analytical method used for the determination of each constituent, the quantities of each constituent found in each test piece after the extractions, the arithmetical mean of the quantities of the constituents determined, the pH factor of the test water, the temperature used, the extraction time, any deviation for the test procedure, and any details not provided for by the test procedures as well as any incidents which might have affected the results.

(*From:* ISO bulletin *March 1991, page 5*)

Lead in workplace air

The latest of the substantial series of standards on determinations of hazards in air at work is ISO 8518. *Workplace air — Determination of particulate lead and lead compounds — Flame atomic absorption spectrometric method*.

Metallic lead is used for lining tanks, pipes, and other equipment where pliability and corrosion resistance are required, such as in the chemical industry in handling corrosive gases and liquids, in petroleum refining and in the building industry. It is also used in the automobile industry, in pigments for paints and varnishes, storage batteries, flint glass, vitreous enamelling, ceramics as glaze and in metallurgy.

Exposure to lead dust may occur during mining, smelting and refining. The dust can be ingested or inhaled. A partial list of other lead-exposed occupations would include ceramic makers, glass making, lubricant making, painting and plumbing. The possible effects on workers range from minor illness in the early states to great suffering caused by irreversible damage to the central nervous system.

Because of more efficient material handling methods, serious cases of lead poisoning are rare in industry today, but there are so many industrial hazards to be checked that a simple and accurate method of determination is needed for a host of substances. ISO 8518 specifies a flame atomic absorption spectrometric method — an instrumental method which is very easy to apply, and is rapid and accurate, using an apparatus that can be quickly reset for different elements.

The various methods are standardized by ISO/TC 146, *Air quality*.

(*From:* ISO bulletin *March 1991, page 4*)

Metallic lead is used in the chemical industry, petroleum refining and in the building industry.

Biennial report of the Treasurer

The following is an abstract of the 1989–90 biennial report of the Treasurer, Prof. Anders Björkman. The full report was presented to Council at the Hamburg General Assembly.

The excess of income over expenditure (USD) for the biennium was as follows (parenthesis indicates deficit):

Accounts		Budget	
1989	53136	(86000)	(as at 87.08.28)
1990	12174	18800	(as at 89.08.17)

The total gain in 1989 of around USD 140000, compared to budget, arises from a few major deviations. A favourable exchange rate between USD and SEK, when making the payments for the Lund General Assembly, produced a saving of USD 70000. IUPAC bodies and the information service used USD 70000 less than the budgetted figure. At the same time, income from assets and publications exceeded the budgetted figure by USD 90000. Thus, a total gain of USD 237000 was made. The gain was counterbalanced by increased office expenses of USD 77000, giving a calculated gain of USD 160000, which is nearly the figure of USD 140000 stated above.

The closeness of the excess figures for accounts and budget in 1990 is somewhat fortuitous. Various savings and an increased income amounted in all to a gain of USD 125000, while expenditure was increased by USD 140000, including high priority projects and Secretariat refurbishment.

The accounting routine has been moved from the Zürich bank (Union Bank of Switzerland) to the Oxford Secretariat where it is computerized. The bank receives, as before, the income of the Union and makes its payments. Moreover, the bank manages the IUPAC money (investments). The audit of the Oxford accounting documents is made locally by an English partner of the official auditor, Neutra Treuhand AG (Zürich), which keeps on issuing the formal reports.

The IUPAC headquarters (Treasurers Office) have been moved from the bank to Neutra. Thus, the legal domicile in Kanton Zürich is sustained and IUPAC retains its tax–free status. The execution of the accounting routine at the Secretariat offers an easier control and the possibility of improved use of resources (management accounting). Also, an internal audit will be introduced on a trial basis.

The financial planning has been enhanced since 1987 by a revision of the budget procedure, which starts well before the General Assembly. In 1990–91 forward financial planning has also been introduced. These achievements have, however, not solved the financial problems caused by new initiatives (restructuring) within IUPAC during 1989–91, the financing of which is impeded by the limitations of income, induced by the unfortunate "freezing" of subscriptions during 1984–89. The developments have necessitated an urgent need for cost reductions, which mark the 1992–93 budget.

Treasurer's comments

The accounts were (for the first time) kept in Oxford, which offers improved possibilities of analysing income and expenditure. Some major observations are given below.

On the *income* side, some subscriptions are (as usual) outstanding. When prospective payments are received, the total figure will at least be as budgetted (USD 504000). A few countries have, for various reasons, been allowed to pay less than the minimum national subscription, calculated according to the 4L scheme, but the only country to loose its membership is Iraq. Romania stays as an Observer Country until further notice.

One income figure only is significantly different from budget, namely the transfer from the publications account, which rose to about USD 141000, being 25000 above the budget estimate.

With regard to *expenditure*, it is noted that the Secretariat has been able to limit its normal expenditure to the budgetted figure of about USD 250000. USD 64000 have been invested in the refurbishment of the Secretariat to bring this lengthy transition to a "happy end". The money remaining of the budgetted expenses for IUPAC bodies has been transferred to 1991 as a provision (committed expenditure), but Officers decided to allocate an additional USD 43000 to high priority purposes (such as the mission-oriented programmes). The IUPAC representation on other organizations has consumed USD 9000 more than budgetted and the audit and bank fees were about 10000 over budget. Some USD 32000 have been used for miscellaneous expenses, which are not specified in the less itemized budget.

In spite of the non-budgetted expenditure, 1990 did not end with a deficit, the reason being not only higher income, but several moderate savings of the order of USD 100000. These comments are hopefully informative and illustrate the difficulties involved in preparing and controlling a budget.

A prediction of the performance of 1991, well before the end of the year, is to be attempted for the first time. It is of particular interest, since the year is budgetted to give a considerable deficit.

IUPAC Accounts for 1990

The audited IUPAC accounts for 1990 are preceded by the auditors' report and comments by IUPAC Treasurer Prof. Anders Björkman.

Balance Sheet as at 31st December 1990 (expressed in USD)

Assets		
Cash in Banks		
US Dollars	24 709.89	
Sterling	20 069.11	
Swiss Francs	275.28	
German Marks	52.36	
Money Market Investments	1 070 321.30	
Cash in East European Banks[a]	8 703.00	1 124 130.94
Marketable Securities at Cost		1 351 483.78
Accounts Receivable[b]		16 056.44
Sundry Debtor		37 424.14
Subscriptions etc., Outstanding[c]		
National Organizations	106 700.00	
Observer Country Service Charges	50.00	
Company Associates Service Charges	2 835.00	109 585.00
		2 638 680.30

Liabilities		
Capital Account		2 301 393.57
Accounts Payable[d]		21 146.79
Paulo Franzosini Fund		5 659.20
Provisions		
Committed Expenditure	136 422.47	
CTC Expenses	970.00	
Bad Debts	62 568.50	
CHEMRAWN Rolling Fund	−3 390.11	
Neutra Examination	5 000.00	
Solubility Data Series	987.53	
Symposia, Seminars, IVPs	5 000.00	
History of IUPAC	20 000.00	
Purchases from Blackwells	2 653.40	
IUPAC Handbook	16 050.00	
Roy. Soc. Contribution to Dev. Activ.	11 344.57	
Kratos Grant[e]	586.34	
Toxicology Glossary	5 939.68	264 132.38
Prepaid Subscriptions[f]		12 050.00
Capital Gains Realized		22 124.57
Excess of Income over Expenditure		12 173.79
		2 638 680.30

Notes for 1990 Balance Sheet

(a) *Cash in East European Banks*

Bulgaria	239.00	
Czechoslovakia	5 194.00	
Hungary	223.00	
Poland	155.00	
USSR	2 892.00	8 703.00

Revalued at 90.12.31 using relevant exchange rates for national currency to USD.

(b) *Accounts Receivable*

List Oxford	16 056.44	

(c) *Subscriptions, etc. Outstanding*

National Organizations (1988)		
Argentina	100.00	
Iraq	2 600.00	2 700.00
National Organizations (1989)		
Argentina	4 800.00	
Cuba	700.00	
Greece	1 400.00	
Iraq	2 600.00	
Ireland	1 400.00	
Peru	700.00	11 600.00
National Organizations (1990)		
Argentina	2 200.00	
Austria	4 750.00	
Brazil	2 000.00	
Chile	1 600.00	
Cuba	1 900.00	
Czechoslovakia	6 600.00	
Ethiopia	400.00	
Greece	2 600.00	
Iraq	3 800.00	
Ireland	3 300.00	
Japan	47 000.00	
Netherlands	600.00	
Nigeria	2 500.00	
Peru	2 100.00	
Portugal	3 200.00	
Turkey	4 300.00	
Yugoslavia	3 550.00	92 400.00
Service Charges Company Associates (1989)		
Italy	25.00	25.00
Service Charges Company Associates (1990)		
Japan	1 900.00	
USA	910.00	2 810.00
Service Charges Observer Countries (1990)		
Nigeria	50.00	50.00
		109 585.00

(d) *Accounts Payable*

List Oxford	18 442.79
List Zürich	2 704.00
	21 146.79

(e) Commission V.2

(f) *Prepaid 1991 subscriptions*

NAO — China/Beijing	12 000.00	
Observer Country — Romania	50.00	12 050.00

Statement of General Income and Expenditure for Year ended 31st December 1990 (expressed in USD)

Expenditure		
Office Expenses		
IUPAC Officers	8 475.23	
IUPAC Secretariat (non-publ.)[a]	305 843.21	
Audit, Bank Fees, Other Charges	56 222.36	370 540.80
Expenses, IUPAC Bodies		
Administration Expenses	34 682.09	
Meetings:		
Other than Gen. Assembly[b]	272 306.06	
General Assembly	8 518.82	315 506.97
Symposia, Seminars, IVPs[c]		5 000.00
Bad Debts Write Off		125.00
Provisions Made		
Symposia, Seminars, IVPs	5 000.00	
Committed Expenditure	136 422.47	
IUPAC Handbook	16 050.00	
Roy. Soc. Contribution to Dev. Activities	11 344.57	
Neutra Provisions	5 000.00	
Kratos Grant	586.34	
Toxicology Glossary	5 939.68	180 343.06
Other Expenses		
ICSU Grant	7 275.60	
UNESCO Contracts	1 000.01	
Toxicology Glossary	2 718.81	
Contribution to ICSU	12 155.27	
Representatives Other Organizations	19 365.69	
Roy. Soc. Contributions to Dev. Activities	7 000.00	
Transfer to Publications Subaccount for Blackwell Purchases and IUPAC Handbook	3 839.32	
Transfer to Affiliates in Dev. Countries	9 449.11	
Transfer to CHEMRAWN Subaccount	10 000.00	
Miscellaneous Expenses	2 466.73	75 270.54
Foreign Exchange Differences		−23 069.86
Excess of Income over Expenditure		12 173.79
		935 890.30

Income		
National Subscriptions		
Received	442 764.62	
Outstanding	92 400.00	535 164.62
Company Associate Service Charges		
Received	5 230.00	
Outstanding	2 810.0	8 040.00
Observer Countries Service Charges		
Received	500.00	
Outstanding	50.00	550.00
Interest and Dividends Earned[d]		172 920.33
Subvention/Grants from ICSU		27 706.00
Transfer from Publication Subaccount		140 715.31
Transfer from AMP Subaccount		10 606.64
Withdrawals from Provisions		
Symposia, Seminars, IVPs	107.00	
Committed Expenditure	4 316.00	
Bad Debts	125.00	
IUPAC Handbook	1 050.00	
Roy. Soc. Contribution to Dev. Activities	2 000.00	
Toxicology Glossary	1 434.00	
Neutra Provision	4 000.00	13 032.00
Other Income		
Kratos Grant	586.34	
Toxicology Glossary	7 224.49	
Pergamon Travel Grant	3 000.00	
Roy. Soc. Contribution to Dev. Activities	16 344.57	27 155.40
		935 890.30

Notes for Statement of General Income and Expenditure for the Year ended 31st December 1990

(a) Includes USD 56 256.97 for major refurbishment of Secretariat and USD 7 561.13 for purchase of additional computer equipment (total of USD 63 818.10) not included in 1990 budget and taken from assets.

(b) Includes USD 42 970.48 not included in 1990 budget and taken from assets.

(c) IVPs = IUPAC Visiting Professorships.

(d) USD 481 interest on capital of Paulo Franzosini Fund already deducted.

Statement of Publication and Expenditure for Year ended 31st December 1990

Expenditure		
IUPAC Secretariat (publ.)		163 355.34
Blackwell Purchases and IUPAC Handbook		3 839.32
Solubility Data Series		
Expended	433.00	
Provision Made	987.53	1 420.53
Chemical Databases		2 685.59
Miscellaneous Expenses		17 216.10
Transfer to General Income and Expenditure Account		140 715.31
		329 232.19

Income		
Blackwell	284 414.61	
Pergamon	10 172.82	
Other Publishers	12 410.37	
Secretariat	365.54	307 363.34
Support of Publication Activities by Blackwell		13 500.00
Transfer for Blackwell Purchases and IUPAC Handbook		3 839.32
Solubility Data Series Income	1 420.53	1 420.53
Last Year Provision for Publication Activities		3 109.00
		329 232.19

Statement of Affiliate Membership Programme Income and Expenditure for Year ended 31st December 1990 (expressed in USD)

Expenditure		Income	
IUPAC Secretariat (AMP)	39 776.38	*Contributions*	
Chemistry International & Leaflets	54 537.90	In USD	71 676.03
Miscellaneous Expenses	4 713.30	Cash in East European banks	6 504.00
Transfer to General Income & Expenditure Account	10 606.64	*Royalties Blackwells*	2 750.07
		Income Ties & Scarves	510.74
		Transfer from General Income & Expenditure Account for Affiliates in Developing Countries[a]	9 449.11
		Transfer from Provision for Affiliate Activities	18 744.27
	109 634.22		109 634.22

Note

(a) IUPAC subsidy for Afiliates in Developing Countries.

Statement of CHEMRAWN[a] Income and Expenditure for Year ended 31st December 1990 (expressed in USD)

Expenditure		Income	
CHEMRAWN Committee Expenses	15 218.71	*Transfer from General Income and Expenditure Account*	10 000.00
Transfer to CHEMRAWN Rolling Fund	−3 390.11	*Transfer from Provision for CHEMRAWN Rolling Fund*	1 828.60
	11 828.60		11 828.60

Note

(a) CHEMRAWN = CHEMical Research Applied to World Needs.

Securities Account Statement as at 31st December 1990

			Approx. Price %	Approx. Value/USD	Book Value at Cost/ USD	Profit/Loss Since Purch. USD
(a) Bonds						
5.75% Deutschland 1986–20.6.96	DEM	200 000	86.20	113 623.67	108 473.00	+5 150.67
6.0% Deutsche Bundepost 1987–1.7.97	DEM	100 000	85.25	56 185.72	55 063.00	+1 122.72
3.5% Rhein. Westf. EW 1986–3.4.96	DEM	125 000	77.40	63 765.02	56 348.00	+7 417.02
6.75% Europ. Investm. Bank 22.8.97	DEM	70 000	88.20	40 690.98	30 937.00	+9 753.98
7% B.P. 1985–14.3.92	JPY	5 000 000	98.25	36 189.41	29 468.00	+6 721.41
11.75% Nat. Westminster 1982–1.11.92	USD	100 000	105.50	105 500.00	99 230.17	+6 269.83
6% UBS 1985–27.11.92	USD	150 000	95.50	143 250.00	134 352.11	+8 897.89
7.75% IBM 30.3.91	USD	100 000	99.88	99 875.00	100 424.85	−549.85
7% Schweden 1987–12.2.92	USD	125 000	99.00	123 750.00	119 524.43	+4 225.57
4.625% Nagasakiya 1987–12.3.92	CHF	100 000	93.50	72 200.70	66 447.00	+5 753.70
6.75% Dow Chemical 1985–24.10.95	DEM	100 000	86.15	56 778.88	44 372.00	+12 406.88
6.5% Philip Morris 1986–14.2.91	JPY	5 000 000	99.56	36 673.04	28 295.00	+8 378.04
Sub-Total Bonds				948 482.41	872 934.56	+75 547.85
(b) Shares						
Shs Fidelity Magellan Fund	USD	8 827.65	52.66	464 864.05	427 526.33	+37 337.72
Parts UBS Money Market Trust	GBP	77	409.79	59 818.26	51 022.90	+8 795.36
Sub-Total Shares				524 682.31	478 549.23	+46 133.08
Grand Total Securities				1 473 164.72	1 351 483.79	+121 680.93

Auditors' Report

As auditors of the International Union of Pure and Applied Chemistry we have examined the accounts for the year ended 31 December 1990 in accordance with the provisions of Swiss law.

We have come to the conclusion that:

- the balance sheet and statement of income and expenses are in agreement with the books,
- the books of account have been properly kept,
- the financial position and the result of operations are presented in accordance with the principles of evaluation prescribed by Swiss law and the requirements of the statutes.

As a result of our examination we recommend that the accounts submitted to you be approved.

Neutra Treuhand AG

IUPAC

Calorimetry and thermodynamics of biological processes

Gullmarstrand, Göteborg, Sweden
15–19 May 1992

The first formal ISBC conference arranged by the International Society for Biological Calorimetry will be the eighth in a series following the 7th ISMAB — International Symposia on Microcalorimetric Applications in Biology — held in Engham, UK, in April 1990.

The conference will be held in a little fishing village at the seaside, Fiskebäckskil, North of Göteborg, Sweden. The meeting will take place in the Gullmarsstrand Conference Centre.

The aim of the 8th ISBC conference is to focus on the use of calorimetry and of thermodynamic analysis in the understanding of the dynamic processes of biomolecules, organisms and ecosystems. This item is of special interest for regulation and control of biological processes of which an understanding has an impact on advances in medicine, environmental protection and biotechnology.

According to the provisional programme, the welcome to the symposium, introductory remarks (L. Gustafsson, ISBC Chairman, Göteborg) and greetings from the official IUPAC representative will take place on the morning of Saturday 16th May.

The scientific programme will start with the 2nd Lavoisier Lecture given by R. B. Kemp (Aberystwyth, UK), followed by five themes.

1. *Growth energetics — budgets and efficiency* including thermodynamic concepts in biological energy transformations. Lecturers: E. Battley (Stony Brook); E. Gnaiger (Innsbruck); L. Gustafsson (Göteborg); R. Welch (New Orleans); H. W. van Verseveld (Amsterdam); H. V. Westerhoff (Amsterdam); U. von Stockar (Lausanne).
2. *Molecular interactions* including binding studies of enzymes, antibodies and other biomolecules; molecular-membrane interactions. Lecturers: R. Biltonen (Virginia); E. Freire (Baltimore); G. Rialdi (Genova).
3. *Biotechnology — technical and conceptual considerations* including instrumentation and data analysis. Lecturers: E. Gnaiger (Innsbruck); D. Kell (Aberystwyth); C. Larsson (Göteborg); I. Marison (Lausanne); B. Mattiasson (Lund); G. Liden and C. Niklasson (Göteborg); I. Wadsö (Lund); B. Zentgraf (Leipzig).

Gullmarsstrand Conference Centre.

4. *Cellular and organism energetics* including physiological and ecological aspects. Lecturers: J. E. Doeller and D. W. Kraus (Alabama); S. C. Hand (Boulder); L. D. Hansen (Utha); I. Lamprecht (Berlin); J. M. Shick (Maine); A. Schön (Lund); J. Widdows (Plymouth).
5. *Pharmacology, toxicology and clinical studies.* Lecturers: A. E. Beezer (Kent); L. Edvinsson (Lund); M. Monti (Lund).

The provisional programme also includes a Workshop on Concepts, Terminology and Compilation of Thermodynamic Data (organized by E. Gnaiger and I. Wadsö) and an ISBC business meeting.

The scientific programme will consist of lectures and poster presentations, arranged around the above five themes. Each theme will conclude with a discussion session focusing on information presented during the lectures and on the posters. The provisional programme gives the more formal contributions from interdisciplinary fields, intended to set the framework for lengthy discussion sessions.

Further contributions to the conference are invived in the form of short oral presentations or posters. These will be fully debated in the discussion sessions, to which all participants are invited actively to particpate. The deadline for submission of abstracts is 15th January 1992.

The official language of the conference will be English. Translation facilities will not be available.

The registration fee will be about SEK 950 for ordinary participants and SEK 250 for students. IUPAC affiliate members are entitled to a 10% reduction on the registration fee. Accommodation (including all meals) at the conference centre will cost about SEK 4 000 for the whole period of the conference.

The symposium will be held in the late spring when the weather is expected to be pleasant with temperatures hopefully reaching 20°C.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained upon request, from the names and addresses shown in brackets.

1992

Enzymes in organic synthesis

6–9 January. International Symposium on Enzymes in Organic Synthesis. New Delhi, India.
(Dr V. S. Parmar, Department of Chemistry, University of Delhi, Delhi-110 007, India. Tel. +91 (11) 2918994 (office) or +91 (11) 7115562 (home). Fax. +91 (11) 352471. Telex 78099-DU-IN.)

Centenary of Geneva conference

22–24 April. Centenary of Geneva Conference — Organic Chemistry: Its Language and Its State of the Art. Geneva, Switzerland.
(Dr M. V. Kisakürek, Editor, Helvetica Chimica Acta, Redaktion, Postfach 313, CH-4010 Basel, Switzerland.)

Biological and environmental reference materials

11–14 May. 5th International Symposium on Biological and Environmental Reference Materials (BERM-5). Aachen, Germany.
(Dr W. R. Wolf, Nutrient Composition Laboratory, United States Department of Agriculture, Beltsville, MD 20705, USA.)

Calorimetry and thermodynamics of biological processes

15–19 May. International Symposium on Calorimetry and Thermodynamics of Biological Processes. Fiskebäckskil, Sweden.
(8th ISBC, Department of General & Marine Microbiology, Carl Skottsbergs Gata 22, S-41319 Göteborg, Sweden.)

Heteroatom chemistry

7–12 June. 3rd International Conference on Heteroatom Chemistry. Riccione, Italy.
(Prof. A. Fava, C.N.R. — I.co.C.E.A., Via della Chimica, 8, I-40064 Ozzano Emilia-BO, Italy.)

Liquid crystals

21–26 June. 14th International Liquid Crystal Conference. Pisa, Italy.
(Prof. E. Chiellini, Dipartimento de Chimica e Chimica Industriale, Università degli Studi di Pisa, Via Risortimento 35, I-56100 Pisa, Italy.)

Organic synthesis

28 June–2 July. International Conference on Organic Synthesis. Montréal, Québec, Canada.
(Prof. Jean-Claude Richer, Départment de Chimie, Université de Montréal, C.P. 6128 succursale A, Montréal, Quebéc H3C 3J7, Canada.)

Surface chemistry, adsorption and chromatography

29 June–3 July, 2nd International Symposium on Surface Chemistry, Adsorption and Chromatography. Moscow, USSR.
(Prof. O. Larionov, Institute of Physical Chemistry, USSR Academy of Sciences, Leninski Prospekt 31, Moscow 117915, USSR.)

Carbohydrates

5–10 July. 16th International Carbohydrates Symposium. Paris, France.
(Prof. P. Sinaÿ, École Normale Superieure, Laboratoire de Chimie, 24 Rue Lhomond, 75231 Paris Cédex 05, France.)

The 16th International Carbohydrates Symposium will be held in Paris.

Ring opening polymerization

7–11 July. International Symposium on Ring Opening Polymerization. Warsaw, Poland.
(R.O.P. Organizing Committee, Institute of Polymer Chemistry, Polish Academy of Sciences, ul. M. Curie-Skłodowskiej 34, 41-800 Zabrze, Poland.)

Solubility phenomena

8–10 July. 5th International Symposium on Solubility Phenomena. Moscow, USSR.

(Prof. V. M. Valyashko, N. S. Kurnakov Institute of General and Inorganic Chemistry, Leninsky Prospekt 31, Moscow, GSP-1, 117907, USSR.)

Computers in chemical research and education

12-17 July. 10th International Conference on Computers in Chemical Research and Education. Jerusalem, Israel.
(Professor Y. Wolman, Department of Organic Chemistry, The Hebrew University, Jerusalem 91904, Israel.)

Risk management of chemicals

13–16 July. International Symposium on Risk Management of Chemicals Can Chemicals be Used Safely? Guildford, UK.
(Dr J. F. Gibson, Secretary (Scientific), The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Macromolecules

13–18 July. 34th International Symposium on Macromolecules. Prague, Czechoslovakia.
(IUPAC Macro 92 Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského ńam. 18882/2, 162 06 Prągue 6, Czechoslovakia. Tel. +42 (2) 360317. Telex 122019 IMCP C.)

Chemistry, agriculture and the environment

17–19 July. International Conference on Chemistry, Agriculture and the Environment. Guildford, Surrey, UK.
(Dr D. Stevenson, Robens Institute of Health & Safety, University of Surrey, Guildford, Surrey GU2 5DX, UK.)

Coordination chemistry

19–24 July. 29th International Conference on Coordination Chemistry. Lausanne, Switzerland.
(Prof. A. E. Merbach, Institute de Chimie Minerale et Analytique, Université de Lausanne, Place du Chateau 3, CH-1005 Lausanne, Switzerland.)

Novel aromatic compounds

19–24 July. 7th International Symposium on Novel Aromatic Compounds. Victoria, B.C., Canada.
(Dr R. H. Mitchell, Department of Chemistry, University of Victoria, Box 3055, Victoria, B.C., Canada V8W 3P6.)

Photochemistry

19–25 July. 14th International Symposium on Photochemistry. Leuven, Belgium.
(Prof. F. de Schryver, Department of Chemistry, Katholieke Universiteit Leuven, Celestijnenlaan 200F, 3001 Heverlee, Belgium.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than 3 months in advance. If a visa is not granted 1 month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

Physical organic chemistry

2–7 August. 11th International Conference on Physical Organic Chemistry. New York, USA.
(Prof. H. F. Koch, Department of Chemistry, Ithaca College, Ithaca, NY 14850, USA.)

Exploration, mining and processing of materials

2–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, Republic of South Africa.
(The Symposium Secretariat, Mintek, Private Bag X3015, Randburg, 2125 South Africa. Tel. +27 (11) 7933511 Fax. +27 (11) 7932413 Telex 424867 SA.)

Macrocyclic chemistry

9–14 August. 17th International Symposium on Macrocylic Chemistry, Provo, Utah, USA.
(Chemistry Department: ISMC, 226 ESC, Brigham Young University, Provo, Utah 84602, USA. Tel. +1 (801) 3782315. Fax. +1 (801) 3785474.)

Chemical thermodynamics

16–21 August. 12th International Conference on Chemical Thermodynamics (ICCT). Utah, USA.
(Chemistry Department: ICCT, 226 ESC, Brigham Young University, Provo, Utah 84602, USA. Tel. +1 (801) 3786269. Fax. +1 (801) 3785474. Telex 706448.)

Biotechnology

16–21 August. 9th International Biotechnology Symposium. Crystal City, Virginia, USA.
(9th International Biotechnology Symposium Headquarters, American Chemical Society, 1155 Sixteenth Street, N.W., Room 205, Washington, D.C. 20036-4899, USA. Tel. +1 (202) 8726286. Fax. +1 (202) 8726128.)

Medicinal chemistry

13–17 September. 12th International Symposium on Medicinal Chemistry. Basel, Switerzland.
(Dr E. Kyburz, F. Hoffmann-La Roche AG, PRPN B 15/115, CH-402 Basel, Switzerland.)

Analytical chemistry

20–26 September. SAC 92: International Conference on Analytical Chemistry. Reading, UK.
(The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Polymer spectroscopy

End–September. 10th European Symposium on Polymer Spectroscopy. Leningrad, USSR.
(Prof. S. Skorokhodov, Institute of Macromolecular Compounds, USSR Academy of Sciences, Bolshoi Prospekt 31, Leningrad 199004, USSR.)

Mycotoxins and phycotoxins

8–12 November. 8th International Symposium on Mycotoxins and Phycotoxins. Mexico City, Mexico.
(Dr D. L. Park, Department of Nutrition and Food Science, 309 Shantz Building, University of Arizona, Tucson, Arizona 85721, USA. Tel. +1 (602) 6215107. Fax. +1 (602) 6219446. Telex 187167 AZUTUC UT.)

1993

Bioorganic chemistry

7–10 June. 2nd International Symposium on Bioorganic Chemistry. Fukuoaka, Japan.
(Symposium Secretariat, 2nd International Symposium on Bioorganic Chemistry, Department of Chemical Science and Technology, Faculty of Engineering, Kyushu University 36, Higashi-ku, Fukuoka 812, Japan. Fax. +81 (92) 6321842.)

Carotenoids

20–25 June. 10th International Symposium on Carotenoids. Trondheim, Norway.
(Prof. S. Liaaen-Jensen, Laboratory of Organic Chemistry, The Norweigan Institute of Technology, University of Trondheim-NTH, N-7034 Trondheim-NTH, Norway.)

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably **2 YEARS** and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *CI*, Vol. 11, No. 1, pp. 4–5, 1989.

Boron chemistry

11–15 July. 8th International Meeting on Boron Chemistry (IMBERON VIII), Tennessee, USA.
(Prof. G. W. Kabalka, Director of Basic Research, The University of Tennessee, Biomedical Imaging Center, 575 Buehler Hall, Knoxville, Tennessee 37996-1600, USA.)

Optics and dynamics of polymers

12–15 July. 33rd Microsymposium on Micromolecules, Optics and Dynamics of Polymers. Prague, Czechoslovakia.
(Dr P. Čefelín, PMM Chairman, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-162 06 Prague 6, Czechoslovakia. Tel. +42 (2) 360317. Fax. +42 (2) 367981. Telex. 122019 IMCP C.)

34th IUPAC Congress

15–20 August. 34th IUPAC Congress. Beijing, China.
(Prof. Xinqui Song, Secretary General of 34th IUPAC Congress, c/o Chinese Chemical Society, P.O. Box 2709, Beijing 100080, China.)

Solution chemistry

15–21 August. 23rd International Conference on Solution Chemistry. Leicester, UK.
(Dr M. J. Blandamer, Department of Chemistry, Leicester University, University Road, Leicester, LE1 7RH, UK.)

1994

Fluorinated monomers and polymers

19–22 July. 34th Microsymposium on Macromolecules, Fluorinated Monomers and Polymers. Prague, Czechoslovakia.
(Dr P. Čefelín, PMM Chairman, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského náměstí 2, CS-162 06 Prague 6, Czechoslovakia. Tel. +42 (2) 360317. Fax. +42 (2) 367981. Telex. 122019 IMCP C.)

Physical organic chemistry

September. 12th International Conference on Physical Organic Chemistry. Padova, Italy.
(Prof. G. Scorrano, Dipartimento di Chimica Organica, Università degli Studi di Padova, Via Marzolo 1, 35100 Padova, Italy.)

Automation and New Technology in the Clinical Laboratory

KIYOSHI OKUDA

Much of the recent progress in medical science and medical care can be attributed to developments in laboratory medicine. Usually, an advance in methodology leads to developments in the field of science; past innovations in laboratory medicine have always been supported by improvements in methodology achieved through the active introduction, understanding and application of technology from chemistry, physics, biology, and related fields. For the future development of laboratory medicine, continued close interaction with the new technologies of these related fields is essential.

This volume reports the proceedings of the 3rd International Congress on Automation and New Technology in the Clinical Laboratory held at Kobe, Japan, 5-8th September, 1989. These published proceedings, from an international group of experts, cover the very latest developments in research on automation in the clinical laboratory including the theory and practical applications of the latest technology.

1990. 318 pages, 182 illustrations.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 44 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International

IUPAC

1992, Vol. 14. No. 1 (January)

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The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

IUPAC

1992, Vol. 14. No. 2 (March)

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Front cover: Budapest, venue of the 33rd IUPAC Congress.

International Union of Pure and Applied Chemistry

Secretary General's Column

Tom West

In his report of the Hamburg General Assembly, Secretary General Tom West comments on the President's report, elections, committee activities, ICSU programmes and the affiliate membership programme.

Introduction

The 36th IUPAC General Assembly took place in Hamburg during the first fortnight of August 1991. First to meet were the seven divisions and the section and their over 100 commissions, working parties, intercommission groups and interdivision groups; the 12 standing commitees; Bureau subcommittees such as the Division Presidents' Group; the Nomination–Election Committee and the Committee on Affiliate Membership. The Bureau itself met on 12–13 August and finally the Council on 14–15 August.

It is the purpose of this particular Secretary General's Column to report on selected items from the list of agenda of (mainly) the Council and the Bureau meetings for the information of those chemists active in the IUPAC bodies and the affiliate members. The reports of the scientific activities of the commissions and divisions are reported in the Commission & Committee News section of *CI*.

First of all, however, it is a pleasure to record the thanks of all who had the good fortune to participate in the General Assembly for the warm welcome extended to us by our host, Deutscher Zentralausschuss für Chemie, and for the smooth efficiency of all the arrangements made on our behalf. Coupled with these thanks I would particularly like to record the Union's great indebtedness to Dr Wolfgang Fritsche, the recently retired Secretary General of Gesellschaft Deutscher Chemiker, who, together with his successor Prof. Heindirk tom Deicko, was responsible for most of the arrangements and who, in various capacities, has been a great friend of IUPAC over the years.

Dr Wolfgang Fritsche (left) and Prof. Heindirk tom Dieck.

Because this is the last of these columns that I shall write, I should as the retiring (retired) Secretary General also like to take this opportunity to express my warmest admiration of our Executive Secretary 'Mo' Williams and his Deputy, Ann Troughton, who mastermind the colossal intricacies of mounting these 10 or so days of intense activity by nearly 750 IUPAC chemists. Even more astonishingly perhaps, they 'sweep up all the pieces' afterwards, making sure that the results of all the discussions are properly consolidated, recorded and saved for the future ongoing programme of IUPAC.

Similarly, I would like to pay tribute to their secretaries, respectively Erica Sheppard and Ulrike Inglis, who have so cheerfully dealt with all our queries at the Secretariat offices at these assemblies for many years and have, perhaps more importantly, kept their two 'bosses' on an even keel year in, year out. To Mike Freemantle, who joined the staff during my period of office to run the affairs of the Affiliate Membership Programme and be Editor of *CI*, I owe a particularly great debt as do all of us who read this most excellent magazine which he and his secretary Mary Patterson turn out every two months. In thanking those staff with whom I have been most closely associated it would be remiss of me not to mention and thank another well-known personality at these assemblies, Dass Gujral, who deals so effectively with all publications of the Union other than *CI*. The Union is indeed fortunate in its staff.

The Council meeting

Delegations from 34 of the 44 National Adhering Organizations (NAOs) — the actual members of the IUPAC — attended the Council meeting and representatives of seven Associated Organizations of the Union. Twenty-three deceased colleagues were honoured by the Council in one minute's silent remembrance. Amongst these were Past-President of the Union (1977–79) George Smets of Belgium (see *CI*, Vol. 13, No. 4, p. 131, 1991) and two Division Presidents who died in office in 1991: Clinical Chemistry Division President Norbetto Montalbetti of Italy (on 21 May — see *CI*, Vol. 13, No. 5, p. 170, 1991) and Applied Chemistry Division President Lewis Coles of the UK who tragically died at the General Assembly on 11 August (see *CI*, Vol. 14, No. 1, p. 7, 1992).

Prof. Allen Bard speaking at the Council meeting.

Report of the President

Outgoing President Yves Jeannin (France), in his State-of-the-Union address (see pages 1–4 of the January 1992 issue), stressed the need not only to maintain the quality as well as the quantity of the Union's work, but to increase its visibility. He reviewed the work of the divisions and the Section on Medicinal Chemistry and outlined the very considerable contributions made by the Committee on Chemical Research Applied to World Needs (CHEMRAWN) and the Committee on Chemistry and Industry (COCI). The Union was now much more outward looking than recently, expanding its links in particular with the International Council of Scientific Unions (ICSU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Thanks to its Affiliate Membership Programme (AMP), it was now open to voluntary association by all chemists the world over, whereas formerly it has been possible, with some justification, to criticize it as an 'exclusive club.' It was noteworthy that AMP now had over 900, mostly young chemist members from developing countries, which formerly had few if any links with IUPAC. Via AMP, IUPAC was now able to disseminate information on its activities regularly to some 80 countries, whereas formerly it was restricted to the 40 or so IUPAC member countries.

Several new limited lifetime commissions were formed at Lund in 1989 to tackle specific objectives over a 4-year period. The President warned that these bodies would have to complete their tasks and be terminated in 1993, in order to allow other new initiatives to be started at that time. He also gave a final warning to all divisions that any 10-year-old projects would be terminated at the General Assembly in 1993 (see SG Column in *CI*, Vol. 13, No. 3, p. 94, 1991). Some core programmes, for example those on nomenclature, might be considered in a sense to be perpetual, but individual projects within them certainly did not so qualify and would be subject to the same restriction.

The mission-orientated Chemistry and the Environment Programme (CEP) had got off to a good start, and its Coordinating Committee was being disbanded. The post of Chief Coordinator occupied by former Past-President Acad. V. A. Koptyug would, however, remain for at least one more biennium.

The President stressed that IUPAC is an international scientific union rather than an international chemical society, and that its resources were correspondingly limited. It therefore had to be rather selective in choosing its programmes and to bring them to a conclusion in a reasonable time.

In drawing his report to a conclusion, President Jeannin voiced the view that the 2-year period of Presidency was too short to permit even the most active of holders to achieve very much. The incumbent had no sooner learned how the Union works, and what tasks might have to be done, than his period of office was over. He urged that the Council should give serious consideration to a 4-year period of office as for the posts of Treasurer and Secretary General, and as prior to 1963 when the 2-year period of office had been introduced to maximize rotation of the Union's chief Officer post amongst the NAOs. A 4-year period would make for greater cohesion and continuity as it did in the other officer posts, and it would be better for the Union. Nevertheless, he was happy to report that the Union was in good shape, due to the high level of activity developed by all its chemists.

Financial matters

The financial position of the Union was reported by Prof. John Ward (UK), Chairman of the Finance Committee (FC). Because his report has already been adumbrated in the excellent article in *CI* (Vol. 13, No. 5, pp. 173–175, 1991), it is not necessary to go into detail, except to underline his advice to the Union to counteract a shortfall of funding by (1) raising its income from national subscriptions, and (2) reducing its operating costs. Neither measure alone would suffice.

He also advocated that the Council should revive the proposal made in Prof. 'Ram' Rao's period of presidential office, that some of the Union's assets should be set aside as a 'Building Fund', with the idea that the Union should acquire its own property in due course. There was no specific discussion of this point by Council but, because it did approve the FC Chairman's report, it can be assumed that it did not disagree with this particular proposal. The Finance Committee is, however, in this matter only advisory to the President and Executive Committee of the Bureau, but Prof. Ward will become the new Treasurer in January 1992 and accordingly a member of the EC.

Prof. Ward's remarks on the state of the Union's finances were supported and underlined by Treasurer Anders Björkman (Denmark) in his presentation of the accounts and the budget proposals for 1992–3. Much of the substance of his remarks was foreshadowed in his thoughtful and far-seeing paper published in *CI* (see Vol. 13, No. 4, pp. 143–147, 1991) and covered in his report (see page 32 of the previous issue of *CI*) so once again little need be said on the subject.

The Treasurer stressed the increased flexibility for more-efficient control of the finances that had now been achieved following the introduction of computerized accounting at the Secretariat during the past biennium, and particularly underlined the need in future to budget for all mission-orientated and other new programmes *ab initio* instead of relying on withdrawal from the Union's assets as in the past few years. The Council did pay due heed to the warnings of the Finance Committee and the Treasurer and accepted the proposed modest increase of National Subscriptions in 1992 by 5% and again 5% in 1993.

Scientific matters

It has never been the purview of this column to review the scientific programmes of the divisions and their commissions as revealed at General Assemblies. These are being covered in the Commission & Committee News section of *CI*. All eight divisions and section reports were presented to the Council before decisions had to be made on the financial proposals for the oncoming biennium. They were approved with little discussion. I need therefore say nothing of them here except that, like the President, and borrowing a word from his native language, I found them to be 'formidable.'

Elections

The situation leading up to the Bureau and Officers elections at Hamburg was dealt with in the previous SG Column (see *CI*, Vol. 13, No. 3, pp. 92–99, 1991). The results have already been announced in the November 1991 issue in a pull-out section, which gives the names of all the new officers of divisions and commissions and so on. Because the *1991–93 IUPAC Handbook* will not appear until mid-1992, all IUPAC chemists, NAOs, and affiliates would do well to keep those particular pages in a safe place for reference.

Professor Allen Bard (USA) has succeeded Prof. Yves Jeannin (France) as President of the Union for the period 1991–93; Prof. Jeannin continues as a member of the Executive Committee and Bureau as the immediate Past-President for the same period. Former Past-President Acad. Valentin Koptyug (USSR) leaves these two committees, having now served the maximum permitted term of office in this capacity.

Professor Heinz Staab (FRG) was elected Vice-President/President Elect for the same period; Prof. Gerrit den Boef (Netherlands) was elected Secretary General (1991–95) in succession to Prof. T. S. West who now leaves the Union, having served the maximum period of office in this capacity. Prof. John Ward (UK) was elected Treasurer (1992–95) in succession to Prof. Anders Björkman (Denmark). Prof. Björkman

Hamburg: some 750 chemists registered at the 36th IUPAC General Assembly held at the University of Hamburg (top left).

will have retired on 31 December 1991, having served the maximum period of office, with Prof. Ward taking over on 1 January 1992.

The Council accepted the recommendation of the Bureau to limit the number of elected members to the minimum of 10. With six members continuing until 1993, there were therefore only four positions to be filled. Professors Mihaly Beck (Hungary), Joshua Jortner (Israel) and Giorgio Modena (Italy), who stood for re-election following completion of their first 4-year period of office, were elected for a final 4-year period (1991–95) and Prof. Animesh Chakravorty (India) took the remaining place against a strong field of candidates.

The continuing members of the Bureau are Ron Brown (Australia), Mary Good (USA), Wei-Yen Huang (China), Shô Itô (Japan), Ingemar Wadsö (Sweden) and Kirill Zamaraev (USSR). Profs Alex Arvia (Argentina) and Norman Sheppard (UK), having completed their terms of office, retired as elected members of the Union. I should like to take this opportunity to say how much I have valued the opportunity to serve with all these colleagues and particularly the distinguished co-retirees Alex Arvia, Anders Björkman, Valentin Andreivich Koptyug and Norman Sheppard.

The new division/section presidents are: R. A. Alberty (USA) — Physical Chemistry; K. L. Komarek (Austria) — Inorganic Chemistry; N. J. Leonard (USA) — Organic Chemistry; W. Heitz (FRG) — Macromolecular; A. Hulanicki (Poland) — Analytical Chemistry; P. S. Steyn (South Africa) — Applied Chemistry; H. P. Lehmann (USA) — Clinical Chemistry; and J. G. Topliss (USA) — Medicinal Chemistry. The retired division/section presidents [Gerhardt Schneider (FRG) — Physical Chemistry; Ekkehard Fluck (FRG) — Inorganic Chemistry; Irina Beletskaya (USSR) — Organic Chemistry; Gerrit den Boef (Netherlands) — Analytical Chemistry; the late Lewis Coles (UK) — Applied Chemistry; the late Norbetto Montalbetii (Italy) — Clinical Chemistry; and Camille Wermuth (France) — Medicinal Chemistry] all gave exceptionally good service to IUPAC at a particularly difficult time. It is a pleasure to thank them.

The new Bureau, meeting briefly after the end of the General Assembly, elected Kirill Zamaraev (USSR) to represent it on the new Executive Committee together with Mary Good (USA) and Shô Itô who were already so serving. Professor Zamaraev replaces Norman Sheppard (UK), who stood down from the Bureau at the end of his first period of office. The other members of the Executive Committee are the officers and Past-President Yves Jeannin of France.

Belgium, which had been excluded from the Union in 1990, because of being in arrears with its national subscriptions, had, earlier in 1991, paid up to date and applied for readmission. Normally Bylaw B.1 requires that a country seeking admission cannot become a member until 1 January of the year following acceptance by the Council. However, because Belgium was a very recent member seeking readmission, Council accepted the recommendation of the Bureau to re-admission immediately, so that it could participate fully in the rest of the General Assembly including all voting.

Reports of standing committees

The reports of the standing committees — Publications, CHEMRAWN, COCI, and Teaching of Chemistry (CTC) — were made to the Council and those of the Interdivisional Committee on Nomenclature and Symbols (IDCNS), Coordinating Committee on Chemistry and the Environment Programme (COCEP) and Coordinating Committee on the Chemistry and Advanced Materials Programme (COCAMP) were made to the Bureau.

Publications

The Union's publications are generally sold on the principle of maximizing dissemination of information at low cost rather than with a view to maximizing income. Nevertheless, they provide some 20% of the Union's gross income. Edwin Becker (USA), Chairman of the Publications Committee did, however, express a certain amount of dissatisfaction with failure of the Union's official publisher to promote sales of our publications as fully as it might have. In fact, he noted that the net income from publications had actually decreased during recent years because of steadily rising inflation costs (in GB-pounds) in the portion of the Secretariat's costs necessarily attributed to publications and a weaker US-dollar (the currency of IUPAC income).

The circulation of *Pure and Applied Chemistry* (*PAC*), the official journal of IUPAC, is 925 copies world-wide. Although this is a small figure, *PAC* is taken by most major research universities, institutes and industries. It is highly cited and widely consulted as the primary repository of all IUPAC recommendations on chemical nomenclature and conventions.

An IUPAC database is in preparation which will permit easy retrieval of bibliographic information on IUPAC commission reports.

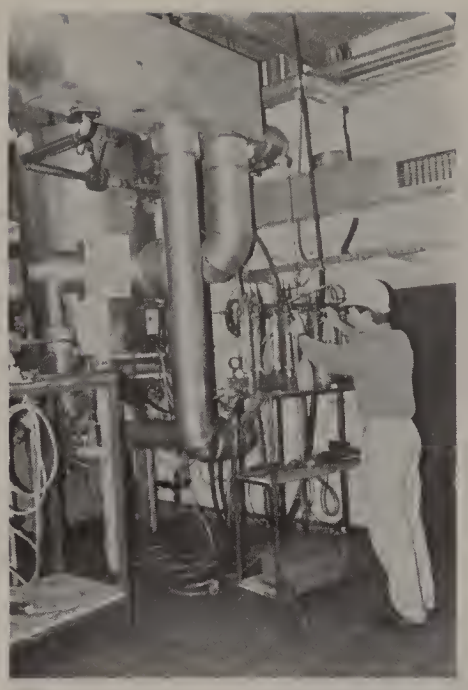
A database of IUPAC reports is being developed, which will permit easy retrieval of bibliographic information on all IUPAC commission reports since 1960. It is hoped to release this as a diskette for personal computers during 1992 and to make it available free upon request to all affiliates and IUPAC committee members. It is also proposed to produce a student-orientated nomenclature paperback book, that will combine all the basic elements of the physical, inorganic, organic, macromolecular and analytical nomenclature compendia of the Union.

CHEMRAWN

The CHEMRAWN Committee report, submitted by the outgoing Chairman Sir John Thomas (UK), reviewed the (then) forthcoming CHEMRAWN VII Conference on the Chemistry of the Atmosphere: its Impact on Global Change to be held in Baltimore, USA on 2–6 December 1991. In line with CHEMRAWN policy this is not only a high-level world conference, but also has a 'future action' component to provide a non-governmental source of advice in the form of a publication aimed at international agencies concerned with the atmosphere. A training workshop for young chemists, many of them from developing countries, is being arranged that will permit them to attend the conference. This is supported by USD 300 000 donated by major industrial corportations in Europe, Japan and the USA.

CHEMRAWN VIII on Chemistry and Sustainable Development towards a Clean Environment will be organized in Moscow in September 1992. It is to be supported by the United Nations Environment Programme (UNEP) and the United Nations Industrial Development Organization (UNIDO) and will be concerned basically with modern technologies to alleviate the legacy of environmental damage and energy waste from previous industrialization, international collaboration on pollution prevention, and the use of so-called waste products as source materials for other processes. It will also focus on the production of a policy document for decision makers in the development of those branches of the chemical industry, which have potentially the most dangerous impact on the environment and human health. Most appropriately, Acad. V. A. Koptyug, IUPAC's 'environment man', is director of the scientific programme for this the first East European CHEMRAWN conference.

Other CHEMRAWN programmes being investigated for feasibility are 'Chemical Education Research: a Precursor to Economic Development'; a young people's CHEMRAWN conference on 'Future Challenges for Chemistry'; and a '2nd CHEMRAWN World Conference on Chemistry and World Food Supplies.' Sir John will have stood down as Chairman in December 1991 after the Baltimore CHEMRAWN conference, and will have been succeeded by the Vice-Chairman, Dr Alan Hayes (UK).



A second IUPAC workshop on safety in chemical production will be held in Yokohama in spring 1993.

COCI

The COCI report was introduced, in the unavoidable absence of its Chairman Dr Dieter Wyrsch (Switzerland), by Secretary Prof. Albert Fischli (also Switzerland). COCI embraces 174 IUPAC Company Associates from 21 countries and in 1990 had 15 committee members. A COCI recruitment leaflet had been produced with the aid of IUPAC's Information Officer, Dr Freemantle.

The outstanding COCI activity during the biennium was its extremely successful 'Workshop on Safety in Chemical Production' at Basel during 9–13 September 1990 (see *CI*, Vol. 13, No. 2, pp. 50–60, 1991). It involved over 130 participants from 44 countries and included 50 from 22 Third World countries, 11 of whom were sponsored by UNIDO, and most of the remainder by COCI from funds collected from chemical and allied industries.

A second workshop on the same theme will be held in Yokohama in spring 1993, with support from UNIDO, UNEP and the World Health Organization Industrial Programme on Chemical Safety (WHO-IPCS). A second follow-up workshop may take place later in the USA with participation particularly from Latin American countries. COCI also has plans for establishing joint UNIDO–COCI training centres for safety in chemical production, and it is discussing the raising of educational facilities for 'hands-on' training and problem solving events in Indonesia or Mexico. Dieter Wyrsch has retired from the Chairmanship of COCI and has been succeeded by Albert Fischli.

There can be no doubt that these 'chemistry in practice' activities of COCI and CHEMRAWN have done an enormous amount of good in raising the visibility of IUPAC and chemistry in the eyes of the scientific community and the informed general public. They have shown how our Union and chemists generally are solicitously and caringly aware of the welfare of mankind and the global environment of our planet.

The *International Newsletter on Chemical Education* provides information on a considerable cross-section of topics of relevance to chemistry teachers.

CTC

Professor Krishna Sane's report on the activities of CTC shows its concern in acting as a catalyst (or inhibitor) in promoting (or discouraging) such trends in teaching as help to bridge the gap between the practice of chemistry and its teaching.

Two problems that showed up in an earlier CTC world-wide survey as being nearly universal were: (1) the absence of an international publication to acquaint secondary school teachers with recent and significant developments in chemistry, and (2) the ever widening gap between increasingly sophisticated and advanced lecture/teaching material and the possibility to teach some of if at practical level in poorly equipped laboratories particularly in less-advanced countries.

CTC responded to (1) by producing regular issues of its now well-known and much-valued *International Newsletter on Chemical Education* (*INCE*). Its response to (2) was the Locally Produced Low-Cost Equipment (LPLCE) programme.

INCE has now produced 34 issues. These were distributed free of cost world-wide, and they provide information on a considerable cross-section of topics of relevance to teachers. Nevertheless, INCE was always in financial difficulties despite much generous support from UNESCO. It needs more regular support from IUPAC itself in future. This plea from Prof. Sané is one which should be heeded more carefully in future.

LPLCE has been phenomenally successful, having developed many instrumental packages that can be constructed, using locally available components in any country. The 'know-how' has been transferred through 42 'hands-on' IUPAC–UNESCO workshops all over the world. Seed groups are now operational in Australia, Brazil, Denmark, France, Germany, Jordan, Philippines, Puerto Rico and Thailand. Complete IUPAC/CTC–UNESCO-sponsored documentation for step-by-step construction and maintenance was now available in English and publication in French, German, Spanish and Portuguese was anticipated to follow soon. A companion volume describing over 100 experiments in pure and applied chemistry, using the LPLCE equipment, is being published. LPLCE has a brigade of 1000 trained teachers and 5000 pieces of equipment in laboratories all over the world, and work is now in progress on micro-scale chemistry programmes and a computerized instrumentation package.

IDCNS and CCDB

IDCNS works behind the scenes, as it were, ensuring that as far as possible all the nomenclature, symbols, units and terminology used in IUPAC publications are in harmony with previous recommendations. This is an enormous and often thankless task. Retiring Chairman Norman Sheppard (UK) deserves many thanks for leading IDCNS so skilfully and successfully during recent years. Ian Mills (UK) takes over from him.

CCDB, chaired by Steve Heller (USA), is now well established and in production with some tangible results that may soon come to the attention of affiliates in particular. CCDB has undoubtedly an increasingly important role to play as we turn increasingly towards newer methods of disseminating information. I commend consultation of its terms of reference in the *IUPAC Handbook 1989–91* (page 45) to all who are active in IUPAC.

COCEP and COCAMP

In 1990, COCEP produced 4000 copies of an IUPAC booklet *Chemisty and the Environment* which listed and gave details of all the completed and (then) current IUPAC projects that related to the environment. Now that a more-structured IUPAC Environment Programme was in place, it was desirable, said Chief Coordinator and COCEP Chairman, Valentin Koptyug (USSR), to produce a new edition of the book or at least a supplement.

Within the IUPAC divisions work is going on in seven subprogrammes:

1. Analytical procedures for the determination of chemical substances in air, water, soil, rocks, living organisms and foods.
2. Measurement of physicochemical parameters related to the environment.
3. Transfer and transformation of chemicals in the environment.
4. Toxicology of synthetic and natural substances.
5. Prevention and clean-up of pollution of the environment using chemical and biochemical methods.
6. Chemical safety.
7. Ecological aspects of chemical education.

COCEP has, through the activity and diligence of its Chairman and President Jeannin, established vitally important close links with ICSU–SCOPE (Scientific Committee on Problems of the Environment), UNEP, UNIDO and UNCED (United Nations Conference on the Environment and Development) and with UNECE (United Nations Economic Commission for Europe).

COCEP's efforts towards broadening the liaisons of IUPAC in the area of environmental activity under the driving influence of Chief Coordinator Koptyug is, with the addition of CHEMRAWN, COCI and AMP, a most impressive testimony to the new outward-looking policy of IUPAC in trying to broaden its horizons and do more for the welfare of mankind.

One cannot help but think that the continuing progress of the COCEP experiment in mission-orientated work is somewhat endangered at present. Sadly the subprogramme leaders of (3) and (4), Lewis Coles and Norbetto Montalbetti, respectively, both died in office. Gerrit den Boef, formerly responsible for (1) and (2), has moved on to other things by becoming Secretary General and Dieter Wyrsch and Maurice Chastrette, the respective leaders of (6) and (7) have now left the Union. Although very fortunately Valentin Koptyug will continue to oversee the programme, even his position at the centre of the Union is weakened because he is no longer a member of the Executive Committee and the Bureau.

Additionally, COCEP itself was disbanded at the Hamburg General Assembly, with the proviso that the Division Presidents' Group would look after the CEP. However, the latter body has hitherto always had a crowded list of agenda of other vitally important matters, and it has only had one afternoon or morning in which to complete its business. There are many pressures from several quarters, particularly and understandably those concerned with protecting the traditional or core activities of IUPAC to restrict expenditure of funds and manpower resources in mission-orientated work. It would be a very great loss indeed to IUPAC, its new outward-looking stance and its visibility, if CEP were now to falter.

COCAMP, under the enthusiastic and dynamic leadership of Past-President 'Ram' Rao, has continued its process of orientation and consolidation. At this stage there is not much that can be added to the information provided elsewhere (for example, *CI*, Vol. 13, No. 3, p. 95, 1991). The Bureau decided that because of financial considerations it would not at this time set up any more mission-orientated programmes.

Changes to Statutes and Bylaws

The Council had before its several proposed changes to its Statutes and Bylaws, many of which were concerned with the incorporation of previous Presidential Rulings. It accepted all the resolutions except one. Most of the changes are of a technical nature, and they need not be given here except perhaps for one which will concern many commission and division committee members, who will be immediately affected by it. This particular technical change relates to the time at which members of committees, commissions, and so on, shall assume and lay down their periods of office. Hitherto, with the exception of the post of Treasurer, this has been immediately after the end of the General Assembly and at the end of the General Assembly in the year in which the period of office is due to cease. In future, and starting with effect from the 1993 General Assembly, all periods of office will begin on 1 January of the year following the General Assembly (about 4 months later), and end on 31 December of the year in which the period of office is due to terminate. This will consequently affect many who had expected to end their service in 1993 at the end of the General Assembly: they will now go on until 31 December 1993.

Prof. 'Ram' Rao.

The proposed change to Statute S 5.1, which would have changed the range of votes in Council meetings from its present 1–6 to 1–8, in recognition of the very high national subscriptions levied on a few NAOs, was defeated by a very small margin, failing to achieve the necessary two-thirds of the total of assigned votes.

The Vice-Presidential Critical Assessment of IUPAC programmes was a very thorough one, and it proposed some more thoroughgoing ordering of priorities than hitherto. The Bureau, particularly the division presidents, felt that they required more time to come to grips with several of these matters and, because they are still under active consideration, with decisions postponed until the 1992 meeting, it would be best to say no more of them at this stage in the debate.

Weapons of mass destruction

I wrote at length in the previous SG Column (see *CI*, Vol. 13, Vol. 3, pp. 97–98, 1991) on the referral of our proposals on the subject of weapons of mass destruction to ICSU. Since then the Executive Committee of IUPAC met in Pretoria, South Africa, in May 1991 and the Executive Board of ICSU in Tokyo in June of the same year.

I did not, as I usually do, write a column on that particular Executive Committee meeting for the simple reason that it was an unusually late meeting and an SG Column written then would have been overtaken by the General Assembly before it could have appeared in print. However, in Pretoria, the Executive Committee firmed up its thoughts on weapons of mass destruction and decided that the subject should relate strictly to the issue of the consequences of the use of these weapons. In respect of chemical and biological weapons this would relate to providing information for the scientifically aware public of the nature of these weapons, the ways in which they are made, transported, stored and deployed, and the attendant risks in each case.

It was felt that the ICSU unions could best help public opinion by providing information on as many aspects of the consequences of having and using such hideous weaponry rather than entering into debate on the ethics of production and use. It was decided to urge ICSU to coordinate and launch such a programme, with IUPAC playing its part in providing information and advice concerning chemical weapons. It was envisaged that the very successful ICSU–SCOPE ENUWAR programme, with its surprise outcome of the 'Nuclear Winter,' would be a good model on which to base a Mass Destruction Weaponry programme.

Furthermore, in Pretoria, the Executive decided, irrespective of whether or not ICSU accept that such a programme should be undertaken, that IUPAC itself would independently enter into a programme of its own on acceptably safe methods of disposal of chemical weapons, namely their destruction, with funds pledged from outside resources. In respect of a potential ICSU programme, it was agreed to set aside up to USD 10 000 in 1992–3 for work by IUPAC on the ICSU programme if launched. In Hamburg, the Council endorsed this action and agreed to the financial provision.

The Executive Committee, at its meeting in Pretoria, decided that IUPAC should enter into a programme concerned with acceptably safe methods of disposal of chemical weapons.

Meanwhile, the ICSU Executive Board, meeting in June 1991, showed considerable interest in the IUPAC proposals and an *ad-hoc* group was set up to study the feasibility and possible terms of reference of such a programme and to report back to the ICSU Executive Board and General Committee at its meeting in Oslo in September 1991.

Writing this column as I do now in late September 1991, I am able to say that the ICSU Executive Board decided to explore the subject further, possibly involving SCOPE and with the addition of two biological and two chemical experts. The group will report back on further action to the ICSU-EB at its meeting in April/May 1992.

World energy supplies

At the Pretoria Executive Committee meeting in May there was a discussion on the pressing subject of world energy supplies. Fossil-fuel reserves are running down at an alarming rate, and early in the next millenium they will be completely exhausted. The public also now perceives that the potential for environmental damage of the continued build-up of atmospheric carbon dioxide levels, with consequent changes to world climate, is unacceptable. As far as provision of an energy alternative to the burning of fossil fuels is concerned, nuclear energy has come to the rescue.

However, most of the nuclear energy so far provided all over the world comes fom nuclear fission, and if reliance were to be continued on this technique the world's resource of nuclear fuel would also soon have been exhausted, and that in only two or three centuries. The advent of breeder reactors overcomes this particular worry, in that such reactors create more nuclear fuel than they destroy, and the world's resource of thorium, for example, is very much greater than that of uranium. The prospect of harnessing nuclear fusion is even more promising, because the supply of deuterium in the oceans is enormous. But all these nuclear processes are also perceived by the general public to be basically unacceptable, because of the inherent radiation dangers of nuclear accidents and the terrible legacy of extremely long-lived and hazardous masses of waste materials that we will bequeath to countless generations of our descendants in the process.

Solar energy (photovoltaic and thermal), wind power, wave power, hydrodynamic power, tidal power, oceanic thermal (heat engine) energy, geothermal energy, fuel cell generation and biomass energy all hold many attractions, but they have never been developed world-wide as have fossil and nuclear-fuel technologies. In addition, it has to be said that one of science and technology's greatest failures to date has been to discover and devise any method of storing electrical power successfully on a massive scale.

We proposed to ICSU that an inter-union ICSU programme was urgently required to persuade world

Energy alternatives to the burning of fossil fuels was one of the topics considered in Pretoria.

governments and the general public that there were alternative technologies which must be developed as a matter of urgency, not only for industrial countries but also those particularly suitable for Third World countries caught in the 'technology trap.' The latter are falling ever more behind, because they have no power resources to allow them to set up their own indigenous technology and compete on a more equal basis with the so-called advanced nations. The ICSU Executive Board was sufficiently interested in the IUPAC proposal to call for a paper to be produced for discussion at its September 1991 meeting in Oslo. Again, I do not have details at the time of writing this column, but I have ascertained that the ICSU Board has decided to consult participants at the ICSU–ASCEND 21 (Agenda for Science for Environment and Development in the 21st Century) conference in Vienna in November 1991, and to set up a 'think tank' activity in this area. This is very promising news.

Affiliate affairs — achievements and progress

In his report to the Council on the Affiliate Membership Programme (AMP), the Secretary General stressed that it was the desire to liberate IUPAC from its previous 'exclusive club' image and a genuine desire to provide facilities for chemists from *all* countries to become associated with their international scientific union of their own volition, that led to the introduction of AMP in 1986. The idea of a body such as IUPAC, which has corporate members only, also having individual members, was initially seen as revolutionary and was welcomed with no great enthusiasm originally in many quarters of the Union.

Fortunately, all the Presidents of the day, and subsequently, were and have been enthusiastic supporters of the concept. In order to get AMP into being, it had to be set up originally in such a way that it did not place any undue burden on the Secretariat staff and the Union's resources, and it was also essential that it should in no way interfere with the membership concerns of the national chemical societies. It was, therefore, established through the membership organizations of the national chemical societies themselves, wherever they were willing to participate.

In effect, each chemical society was asked to form a national IUPAC affiliate group with the sum total of all of these constituting the IUPAC affiliate membership. This worked well at the outset, and the target of 10 000 members was soon being quickly approached. But as a result of the manner of setting up the programme, at no time was the Union in a position to undertake recruitment drives to raise the numbers, and so difficulties have arisen following the initial impetus. It was notable, however, that in the only area where IUPAC itself had control of recruitment, namely in developing countries where there frequently was no NAO, the numbers had risen steadily from 293 in 1986 to just under 1000 in 1991.

AMP had allowed the Union successfully and regularly to disseminate information on its activities in 80 countries whereas formerly it had done so in only 40+ countries. AMP, through its distribution of *CI*, had become IUPAC's chief publicity and information distribution arm.

There was, however, a very real need to persuade the adhering chemical societies to undertake recruitment drives (with help from IUPAC) to encourage many more chemists to support their international scientific union. Benefits for affiliate members were, in the Secretary General's opinion far too few, and they should be improved considerably, as soon as possible, further to encourage recruitment and in particular to make the Union more attractive to young chemists.

To this end, he welcomed the initiatives now beginning to be undertaken by the new Committee on Affiliate Membership. He had wanted to institute CAMP in 1987, but the Council had not been in favour at that time. Benefits for affiliates were improving slowly but surely, and interest in IUPAC had now reached an all-time high, as shown by the number of enquiries now being received at the Secretariat.

This year (1991) every affiliate received a membership package containing a membership card and certificate and a copy of the green laminated card with the abbreviated list of IUPAC-approved quantities, symbols and units, along with their May issue of *CI*. The number of affiliates being recruited by the commissions was slowly increasing. But more had to be done.

The Committee on Affiliate Membership (CAM) spent some considerable time discussing membership numbers. Numbers had started off at 5000 in the first year, had peaked at 8000 in 1989, but fallen to 7000 by 1991. Prof. Shô Itô (Japan) made the useful offer

IUPAC is trying to encourage National Adhering Organizations to recruit more chemists as affiliate members of the Union.

of finding out why those Japanese members who had not rejoined in 1991 had so decided, as a useful case study to add to a previous survey in the USA which provide information on why people had joined in the first instance.

CAM concluded that it was essential to attack the problem of raising the level of membership from both sides, that is by making membership more attractive, particularly to young chemists and to ensure that active recruitment was pursued in future. Not very much could be done in 1992, because the national chemical societies would already have sent out their membership renewal notices before the Union could mount a campaign. It was therefore essential to tackle the problem in the first half of 1992 in order to begin to redress the problem in 1993, in which year the Council would be reviewing the operation of the programme.

In 1991 the Treasurer had agreed to set aside in his budgets for 1992 and 1993 funds for further membership packages to be distributed with affiliate copies of *CI*. In 1992, the package would include the latest IUPAC-approved table of atomic weights. It was also proposed to make available, upon request, free copies of the floppy disk containing physical chemistry data now being prepared by the Physical Chemistry Division and the similar database for personal computers being prepared by the Publications Committee, containing bibliographic details of all IUPAC reports published in *PAC* since 1960.

A selection of affiliates would be actively consulted in future, each time a new provisional report on nomenclature was produced by a commission. A group of some 20 affiliates would be chosen on each occasion, on a geographic basis from the list of members that had expressed an interest in the work of that particular commission. Apart from turning fresh minds onto the problems, to the benefit of the Union and affiliates, it would also provide a useful introductory channel of communication between affiliates and commission members.

The official IUPAC publisher provided information that a significant number of its sales of books now took place through the affiliate member concession scheme, and it was hinted by the Publications Committee that the concessionary benefit might be increased. These are all encouraging signs of an outward-looking attitude in IUPAC, where there was formerly an exclusive club or charmed-circle network. I sincerely hope that all concerned will seize the new opportunities that now promise to make the AMP and its affiliate members a real force on the IUPAC scene.

I am happy to announce that Prof. Heinz Staab (FRG), President-Elect of the Union, will succeed as Chairman of CAM, and become thereby the IUPAC officer principally responsible for the affairs of affiliates.

In conclusion

Council accepted that the next General Assembly (No. 37) will take place in Lisbon during 5–13 August 1993 and that the 34th IUPAC Congress will follow in Beijing on 15–20 August. Provisional acceptance was given to the invitation from the UK National Committee for IUPAC to hold the 38th General Assembly at the University of Surrey in Guildford, UK in 1995 and to the invitation from the Turkish Chemical Society to hold the 35th IUPAC Congress in Istanbul in the same year. These provisional acceptances will require confirmation at the Council meeting in 1993.

And now it remains for me only to thank all of you who have read this column and, I hope, some of its predecessors over the past 9 or so years. It has been a rare privilege to serve IUPAC as its Secretary General since 1983 and before that in several capacities in the Analytical Chemistry Division. I have met and got to know many very fine people in the process over these years. I shall, God willing, continue to be an eager and interested affiliate and an avid reader of *CI* in future years.

Prof. Tom West retired as Secretary General at the Hamburg General Assembly having served in this office since 1983.

The Budapest Congress

The 33rd IUPAC Congress, organized by the Hungarian Academy of Sciences, took place in Budapest from Saturday 17 to Thursday 22 August 1991. The scientific programme was devoted to seven fields of chemistry.

Introduction

The 33rd IUPAC Congress was held at the Technical University of Budapest from Saturday 17 to Thursday 22 August 1991. This was the first time that an IUPAC Congress had been held in Hungary. The meeting was organized by the Hungarian Academy of Sciences and sponsored by the National Committee for Technology Development, Ministry of Industry and Commerce, CHINOIN Pharmaceutical and Chemical Works Co. Ltd, Institute of Drug Research and the Hungarian National Oil and Gas Trust.

At the opening ceremony, Prof. Ernö Pungor, President of the 33rd IUPAC Congress, Mr Árpád Göncz, President of the Hungarian Republic, and Prof. Allen J. Bard, President of IUPAC addressed participants. The Congress aimed to provide a wide-ranging survey of the present state of knowledge and future trends in various branches of chemistry. The scientific programme included eight plenary lectures, over 100 keynotes lectures and poster sessions in the following seven fields of chemistry:

- perspectives of analytical chemistry;
- inorganic and physical chemistry;
- electrochemistry and electroanalysis;
- chemistry and biochemistry of biologically active organic compounds;
- biotechnology;
- chemistry of fats;
- polymeric chemistry.

The following report highlights some of the plenary and keynote lectures and is based on the abstracts presented to participants at the Congress.

Opening of the 33rd IUPAC Congress in Budapest. From left: Prof. John Polanyi (Nobel Laureate, Canada); Mr Arpád Göncz (President of the Hungarian Republic); Prof. Ernö Pungor (President of the Congress) and IUPAC President Prof. Allen Bard (USA).

Plenary lectures

The first plenary lecture was presented by IUPAC President Allen Bard after the opening ceremony. The title was 'New challenges in electrochemistry and electroanalysis.'

Bard pointed out that the challenges and opportunities that face electrochemistry and electroanalytical chemistry arise from advances in technology and from the emergence of important new scientific areas and problems. Our ability to construct very small electrodes, sometimes with nanometre dimensions, and to measure small currents generated at these, have made possible measurements at very short times and in very resistive solvents. These new solvents, such as liquid SO_2 or supercritical fluids, have, in turn, led to the investigation of greatly expanded potential regimes. The invention of scanning probe microscopies (e.g. STM, SECM) now allow very-high-resolution examination of topography and chemical nature of electrode surfaces.

Electrochemical methods should continue to play an important role in new fields, for example molecular biology and materials science: interactions of molecules with DNA can be probed by voltammetric measurements and highly sensitive analytical methods based on electrogenerated chemiluminescent labels attached to antibodies have been developed.

The following day, Sunday, two Nobel Laureates presented plenary lectures: Profs. Jean-Marie Lehn (France) and John Polanyi (Canada).

The title of Lehn's lecture was 'Supramolecular chemistry: from molecular recognition towards molecular information processing and self-organization'. According to Lehn, supramolecular chemistry has

relied on more-or-less pre-organized molecular receptors for effecting molecular recognition, catalysis and transport processes. A step beyond consists in the design of systems undergoing *molecular self-organization*, i.e. systems capable of spontaneously generating a well-defined supramolecular architecture by *self-assembling* from their components in a given set of conditions.

The *molecular information* necessary for the process to take place must be stored in the components and acts through selective molecular interactions. Thus, these *programmed molecular systems* operate via molecular recognition.

Several approaches to self-assembling systems have been pursued:

- the formation of helical metal complexes, the *double-stranded helicates*, that result from the spontaneous organization of two linear polybipyridine ligands into a double helix by binding of specific metal ions;
- the generation of *mesophases* and *liquid crystalline polymers* of supramolecular nature from complementary components, amounting to macroscopic expression of molecular recogition;
- the molecular recognition directed formation of *ordered solid-state structures*.

The design of molecular information dependent, *'informed'* and functional self-organizing systems represents new horizons in supramolecular chemistry towards *'intelligent'*, functional supramolecular materials, network engineering and polymolecular patterning.

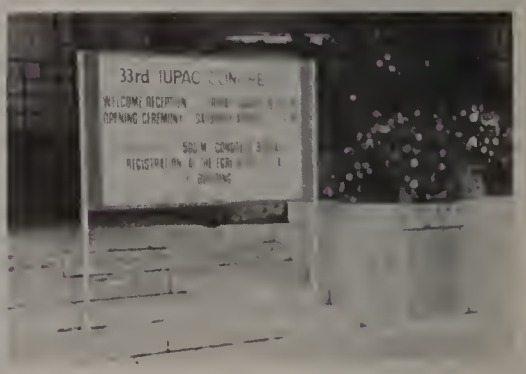
Polanyi lectured on 'Dynamics of elementary reactions.' His talk, which was aimed at a general audience of chemists, began with a survey of developments in the field of reaction dynamics, in order to illustrate advances that have been made in regard to our understanding of the motions of atoms and molecules in simple chemical exchange reactions:

$$A + BC \rightarrow AB + C.$$

He then described methods, such as the 'spectroscopy of transition states' and 'surface-aligned photochemistry' (SAP) currently being applied to the same problem. SAP is a rapidly growing field in which single crystals are mounted in ultrahigh vacuum and are coated with a monolayer of substrate which is then laser irradiated so as to induce photochemistry in an ordered medium. Apart from their fundamental interest, SAP reactions could have relevance to prebiotic chemistry (the origin of life) and to the depletion of ozone in the upper atmosphere. From an industrial standpoint, the field of SAP is of interest in, for example, the etching of semi-conductors.

The other plenary lectures presented at the Congress were:

- Philosophical aspects of analytical chemistry (H. Malissa, Austria).
- Dynamics of vibrationally highly excited molecular states (J. Troe, FRG).
- New trends in measurement and control of biotechnological processes (K. Schügerl, FRG).
- Edible fats today and tomorrow (K. F. Gander, FRG).
- Morphology of polymers (A. Keller, UK).



The 33rd IUPAC Congress was held at the Technical University of Budapest (top right) which lies on the bank of the Danube.

IUPAC affiliates Dr Christien Strydom (University of Pretoria, South Africa) and Dr Miguel Castiñeira (University de Alcalá Henares, Madrid, Spain). Strydom (left) contributed a poster on 'The influence of halide and silver ions on coated silver halide ion selective electrodes' and Castineira one on 'The value of n-6 fatty acids in diet supported therapy, in preventative nutrition and in health enhancement.'

Analytical chemistry

In Section I on Perspectives of Analytical Chemistry IUPAC affiliate George H. Morrison (Cornell University, USA) presented a lecture on 'Chemical imaging using ion microscopy and digital image processing.' Morrison received a travel award from the US National Research Council, National Academy of Sciences, to attend the Congress.

In his lecture, Morrison pointed out that the ability to map the quantitative distribution of elements on the scale of a micrometre or smaller with high sensitivity and isotopic discrimination is unique to ion microscopy (secondary ion mass spectrometry). The information contained in ion images can be crucial to the study of the solid state, where chemical heterogeneity is often directly related to observed behaviour.

The tools of digital image processing allow the extraction of quantitative information from the image data. These techniques coupled with improved instrumentation for the detection of ion images drastically increase the problem solving capabilities of the ion microscope. In his paper, Morrison applied the use of such methods and instrumentation to problems in semiconductor technology and in biology and medicine.

Prof. Hans-Joachim Ache (Institute of Radiochemistry, Karlsruhe, FRG) lectured on 'Analytical chemistry in nuclear technology.' In his review, he discussed the special needs and problems of analytical chemists in the nuclear technology field and demonstrated in which respect they are unique and different from those of other analytical chemists working in the classical areas of chemistry.

There are various areas in nuclear technology in which a great demand exists for analytical and radioanalytical techniques. These can be summarized as follows:

- nuclear-fuel fabrication;
- reprocessing of nuclear fuel;
- nuclear-waste management;
- nuclear safeguards.

In his paper, Ache highlighted a selection of newly developed analytical and radioanalytical methods for the determination of trace and matrix elements and for speciation in the area of reprocessing and nuclear-waste management especially for the composition of the so-called medium-activity waste (MAW).

Inorganic and physical chemistry

In Section II on Inorganic and Physical Chemistry, Prof. Yuan T. Lee, an IUPAC affiliate from the Lawrence Berkeley Laboratory, California, USA, delivered a lecture on 'Recent advances in molecular beam chemistry.' The lecture was concerned with the investigation of the dynamics of elementary chemical reactions and primary photochemical processes using various molecular-beam and advanced laser techniques.

He gave examples to illustrate how detailed information on dynamics and mechanisms of elementary chemical reactions and primary photochemical processes can be obtained from precise measurements of angular and velocity distributions of products.

By studying reactions of ground state and electronically excited barium atoms using crossed supersonic beams, Lee's team were able to explore the role of barium's second valence electron in chemical reactivity.

As in the case of monovalent alkali atoms, reactions of Ba with NO_2, O_3 and ClO_2 are initiated by long-range electron transfer. But due to the divalent character of barium, the ensuing chemistry is considerably richer. Two chemically distinct reaction channels are observed for each molecule.

Lee discussed the angular and velocity distributions of these products. He pointed out that reactions with water or alcohols, on the other hand, can only result from a close collision because long-range electron transfer is not possible. He also discussed the effect of the initial Ba electronic state and the importance of H atom migration in these reactions.

Professor Haruo Kuroda (University of Tokyo, Japan) presented a lecture on 'The chemical and photochemical reactions of metal carbonyl cluster compounds on solid surfaces'. Kuroda pointed out EXAFS (extended X-ray absorption fine structure) spectroscopy by use of synchrotron radiation provides information about the local structure surrounding metal atoms in metal carbonyl cluster compounds absorbed on the surface of a support and those in the chemical species derived from them.

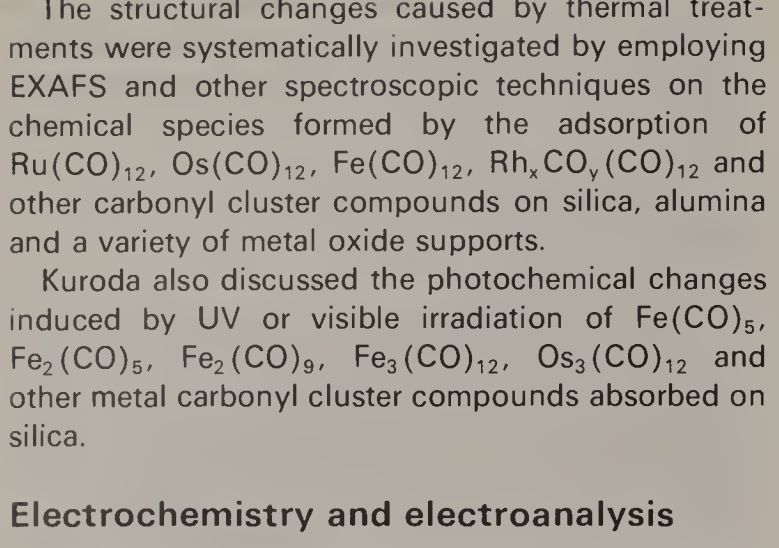
The structural changes caused by thermal treatments were systematically investigated by employing EXAFS and other spectroscopic techniques on the chemical species formed by the adsorption of $Ru(CO)_{12}$, $Os(CO)_{12}$, $Fe(CO)_{12}$, $Rh_xCO_y(CO)_{12}$ and other carbonyl cluster compounds on silica, alumina and a variety of metal oxide supports.

Kuroda also discussed the photochemical changes induced by UV or visible irradiation of $Fe(CO)_5$, $Fe_2(CO)_5$, $Fe_2(CO)_9$, $Fe_3(CO)_{12}$, $Os_3(CO)_{12}$ and other metal carbonyl cluster compounds absorbed on silica.

Electrochemistry and electroanalysis

The title of Prof. Klara Tóth's lecture in Section III of the Congress was 'Electrochemical detection in continuous flow analysis: possibilities and limitations.' Tóth, who is from the Technical University of Budapest, suggested that continuous flow techniques offer one of the most effective approaches to obtaining analytical data on a large scale for the chemical control in environmental protection, physiology and process monitoring. The development of flow methods and flow through detectors are interdependent.

Tóth pointed out that electrochemical sensors are extensively used in different flow methods in order to automate electroanalytical techniques and also to achieve improved sensor characteristics. Tóth's lecture surveyed flow analytical methods and the role of electrochemical methods. It also reviewed the trends in development of flow-through electrochemical detection and demonstrated the potential of electrochemical flow methods using selected examples.



Professor Bert Fraser-Reid (Duke University, North Carolina) and (right) Prof. Cynthia Zoski (University of Rhode Island) were amongst the US chemists who received travel awards from the National Research Council, National Academy of Sciences, to attend the Congress. Fraser-Reid delivered a keynote lecture on 'Recent developments in the chemistry of n-pentenyl-glyocides' and Zoski a poster on 'Steady-state voltammetry at an inlaid microdisc: comparison of three approaches.'

The lecture discussed the effect of the hydrodynamic parameters and the dynamic response characteristics of electrochemical sensors on the flow injection signal. It also outlined a new, flow injection approach for the determination of the dynamic response characteristics of ion-selective electrodes.

A lecture by Prof. M. Thompson (University of Toronto, Canada) was entitled 'Transduction of chemoreception in chemical signalling.' The paper had its origins in the view that perturbation of the electrochemistry of conductive pathways offers an interesting model for the development of biosensors.

The paper described the covalent deposition of specially synthesized lipid species on gold and platinum surfaces. The monolayers are characterized by X-ray photoelectron spectroscopy, SIMS (secondary ion mass spectrometry) and STM. The results of conductance and capacitance measurements were compared with analogous values from the integral free-standing bilayer. Thompson discussed the response of the various monolayer systems to proteins and other species and early efforts to produce a sensor device structure based on the above work.

Biologically active organic compounds

Section IV of the Congress was concerned with 'Chemistry and Biochemistry of Biologically Active Organic Compounds'. In this section, IUPAC affiliate Dr Nicholas Bodor (University of Florida, USA) presented a keynote lecture on 'Drug discovery by retrometabolism: concepts, principles and applications.'

Bodor pointed out that the therapeutic index (TI) is the most important characteristic of a drug, reflecting its selectivity and margin of safety. Thus, the TI and not the intrinsic activity should be the objective of new drug discovery by design. As most often, the toxicity of a drug is related to its metabolism, designing the drug metabolism together with activity considerations can lead to dramatic improvement of TI.

One major concept, the 'soft drug' approach, uses retrometabolism as the basis for drug design. According to this, starting from known or designed inactive metabolites, new drugs can be designed in such a way as to have the desired intrinsic activity, but to be metabolized back to the very inactive metabolites in a predictable way by a controllable rate.

These approaches are general and are based preferentially on hydrolytic enzymes, although other routes were also considered by Bodor. Bodor discussed the design principles, selection of lead compounds, the starting inactive metabolites, (including computer-assisted methods), the unique chemical problems involved in the synthetic 'activation' steps, and selection criteria. He presented specific examples in various drug classes.

Classes of 'soft' corticosteroids were designed using these principles, starting from cortienic acid (CA), an inactive metabolite of hydrocortisone. By modifying

IUPAC affiliates Dr Nicholas Bodor (left) and Prof. Murray Moo-Young both presented keynote lectures at the Congress.

the 17α-OH and 17β-COOH functions in CA and its analogs, potent corticosteroids were obtained, which, however, undergo facile metabolism to the inactive cortienic acid derivatives. These properties result in high local (eye, skin, lung, etc.) activity, but essentially without any unwanted side-effects (adrenal suppression, immunosuppression, elevation of intra-ocular pressure, etc.). Similar principles were applied to β-adrenergic blockers, anticholinergic agents, and others. He also discussed retrometabolic principles for chemical-enzymatic drug targeting.

Biotechnology

IUPAC affiliate Prof. Murray Moo-Young (University of Waterloo, Canada) lectured on 'Bioprocessing innovations for industrial biotechnologies' in Section V on Biotechnology.

Moo-Young presented an overview on generic methodologies for handling microbial, plant and animal cells. In particular, he identified some challenges in the efficient handling of shear-sensitive and/or viscous non-Newtonian bioprocessing materials. He illustrated innovations in hardware and software designs for bioreactors and bioseparators with his own results from research and development work on trickle-bed, air-lift and static-mixer multiphase contacting devices. He also addressed ongoing problems in scale-up procedures. These aspects are important in the strategic planning for achieving a competitive edge in industrial biotechnologies.

In the same section, Prof. Matti Linko (Biotechnical Laboratory, Espoo, Finland) delivered a lecture on 'Immobilization of enzymes and cells.' Immobilization of enzymes or cells gives technical and economical advantages in many applications. The bioreactor is compact, the process can be operated continuously and it can be readily controlled. In some cases, enzyme properties can be altered favourably by immobilization. A number of methods and carriers are available.

An example of large-scale industrial application is the use of immobilized glucose isomerase. Various types of enzyme preparations have been marketed for this process, such as highly purified enzymes bound on organic or inorganic carriers as well as immobilized whole-cell material. Immobilized β-galactosidase is also being used in industry for hydrolysis of lactose in acid whey.

An interesting example of immobilized living cells is a bioreactor replacing conventional secondary fermentation in brewing. In this novel system a residence time of only 2 h can be used instead of several weeks' lagering. Main fermentation with immobilized yeast is also being developed.

Chemistry of fats

Section VI on the Chemistry of Fats included a paper by Prof. Dipak Kumar Bhattacharyya (Calcutta University, India) on 'New raw materials in the vegetable oil industry.'

According to Bhattacharyya, the vegetable oil industries all over the world are always looking for new materials for use in food and industrial products. These new materials include invariably new or relatively less well-known oils and fats, new kinds of modified fat products, and new refinery by-product derivatives.

There are a number of new or less-well known oils in India whose fatty acid compositions resemble most edible oils. These oils have scope for use as either edible oils or in making plastic fats like vanaspati and margarines after purification and modification by chemical interesterification.

New kinds of modified fat, such as enzymatically and chemical interesterified fat, can be prepared from some saturated acid-rich fats and liquid oils blends and used as vanaspati and margarine fats satisfactorily. Enzymatic acidolysis provides new raw materials like cocoa butter substitutes from some selective fats.

Long-chain fatty alcohol esters of ricinoleic acid having specific properties can be prepared from castor oil by enzymatic alcoholysis to yield surface-active molecules on sulphonation with better surface-active properties than the sulphonated castor oil.

By-products like rice-bran fatty acid distillate and rice-bran wax can be important materials in pharmaceutical and industrial products after appropriate derivatization.

A paper by Dr Augustine Ong (Malaysian Palm Oil Promotion Council, Malaysia) considered 'Palm oil — the cinderella among vegetable oils'. The paper traced the phenomenal growth of the Malaysian palm oil industry up to the twenty-first century.

In the process of this rapid development, the industry faced many challenges including the anti-palm-oil campaign in the United States. The paper discussed steps taken in respect of this campaign through intensifying research on the nutritional aspects of palm oil and mounting promotional programmes.

Vegetable oils — one of the topics of the Congress.

According to Ong, these efforts have demonstrated that palm oil is indeed a nutritious edible oil.

Polymer chemistry

IUPAC affiliate Prof. Zbigniew Jedliński (Institute of Polymer Chemistry, Polish Academy of Sciences, Zabrze) lectured on 'The role of single and two electron transfer in organic reactions and ring opening polymerization.' In the paper, Jedliński pointed out that electron-transfer processes are very common in chemistry — in organic synthesis and anionic polymerization.

As a novel reagent involving an unusual electron transfer, complexes of potassium and sodium with a crown ether or a cryptand $Me^- Me^+$(18Cr6) have recently been employed in ring opening polymerization and organic synthesis.

Jedliński elaborated a convenient method of preparation of these complexes. The mechanism of β-lactones polymerization with this initiator was studied by model reactions, polymer end-group analysis, NMR and ESR measurements. Unusual two-electron transfer from an alkali metal anion towards a lactone molecule was postulated at the initiation steps of the polymerization. Jedliński discussed the advantages of the so-called uncommon 'living' type of polymerization. His group has also accomplished synthesis of several 'tailor-made' block polymers.

Finally, Jedliński presented mechanisms of some organic reactions of β-lactones, cyclanones, cyclic ethers with K^-, K^+(18Cr6), involving electron transfer processes and their preparative utility.

Dr Jan Pospíšil (Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Prague) presented a lecture on 'Current understanding and exploitation of stabilization mechanisms in polymers.'

Pospíšil used the chemistry of transformations of phenols and aromatic amines to explain the activity and optimum exploitation of both classes of stabilizers in anti-oxidant, antifatigue and/or anti-ozonant processes in polymers. Some compounds formed from originally added stabilizers contribute, due to their active participation in the stabilization process, to the overall protective effect in a regenerative and/or over-stoichiometric way. In some cases, the creation of transformation products is a necessary condition of the stabilizing activity. Specific attention has been paid to chemical aspects of hydro-peroxide decomposers, and aspects of cooperation between phenols and/or sulfur-containing anti-oxidants and hindered amines.

Pospíšil outlined specific mechanistic features characteristic of thermally and photochemically induced processes and relations involved in stabilizer mechanisms.

Chemical nomenclature in Hungary

Piroska Fodor-Csányi outlines 30 years of work in Hungary on chemical nomenclature.

Anniversary

The 30th anniversary of the publication of the first Hungarian document on chemical nomenclature occurred in January 1992. Work on chemical nomenclature started in the country in 1960 when the Commission on Nomenclature was set up by the Chemical Section of the Hungarian Academy of Sciences under the guidance of Academician T. Erdey-Grúz.

Drafts of the theoretical basis of the work were reviewed by many chemists in Hungary. This was because it was considered important to establish a uniform Hungarian chemical nomenclature based on international recommendations in order to reduce the confusion that existed in the field.

The adaptation and formulation of IUPAC names in Hungarian presented problems because, in many cases, the rules for translation resulted in names different from those recommended. This difficulty arose from the names of the common elements such as sulfur, carbon, iron and copper and commonly used (trivial) names of important acids. As in many other languages, the Hungarian names for these elements are very different from the English names. In these cases the adaptation gave a taxonomic list, e.g. a list of names of the anions as exceptions to the rule.

First publication

The first volume of Hungarian chemical nomenclature recommendations was published in 1962. It included an adaptation of the *Nomenclature of Inorganic Chemistry* [IUPAC Recommendations (R), 1957] and *Nomenclature of Organic Chemistry* (R, 1957).

An extended and revised edition of this volume of Hungarian chemical nomenclature was published in 1972 and included *Nomenclature of Inorganic Chemistry* (R, 1970), *Nomenclature of Organic Chemistry* (R, 1957; R, 1965) and *Manual of Symbols and Terminology for Physicochemical Quantities and Units* (R, 1969). In order to facilitate the propagation of the uniform nomenclature a compilation of inorganic and organic compounds was appended.

There has been a need for a brief summary of the most important rules in order to promote the widespread use of uniform Hungarian nomenclature. This was the purpose of the book *Fundamental Principles of Chemical Nomenclature and Orthography*, published in 1977. It contained the most important rules in inorganic, organic and physical chemistry in such a way and to such an extent as they occur in chemical education. The aim of the book was to help students and teachers of chemistry from the primary to the tertiary levels.

After 1977, a change took place in the policy for publishing nomenclature. A decision was made to publish IUPAC Recommendations, as soon as they were available, in the journal *Chemical Publications* (*Kémiai Közlemények*) of the Hungarian Academy of Sciences. This enabled chemists to keep abreast of successive IUPAC publications. This activity concentrated on three branches of chemistry: inorganic, organic and physical chemistry.

In inorganic chemistry, the following recommendations were adapted: *Nomenclature of Inorganic Boron Compounds* (R, 1971); *How to Name an Inorganic Substance* (Pergamon Press, 1977), *Recommendation for the Naming of Elements of Atomic Number Greater than 100* (R, 1978) and *Isotopically Modified Compounds* (R, 1981).

In organic chemistry, the following recommendations were published: *Definitives Rules for Nomenclature of Steroids* (R, 1971); *Stereochemistry* (R, 1974); *Nomenclature of Carotenoids* (R, 1974); *Isotopically Modified Compounds* (R, 1978) and *Revision of the Extended Hantzsch–Widman system of Nomenclature for Heteromonocycles* (R, 1982).

In physical chemistry, the following were adapted and published: *Definition, Terminology and Symbols in Colloid and Surface Chemistry* (R, 1971); *Heterogeneous Catalysis* (R, 1975); *Manual of Symbols and Terminology for Physicochemical Quantities and Units* (R, 1979); *Notation for States and Processes: Significance of the World Standard in Chemical in Chemical Thermodynamics and Remarks on Commonly Tabulated Forms of Thermodynamic Functions* (R, 1981); and *Quantities, Units and Symbols in Physical Chemistry*.

Piroska Fodor-Csányi was a Titular Member of the Commission on Nomenclature of Inorganic Chemistry from 1979 to 1987, and an Associate Member between 1987 and 1991. She now serves as the Hungarian National Representative on the Commission.

Electrochemistry nomenclature

In recent years much nomenclature activity in Hungary has focused on the field of electrochemistry. The following recommendations have all been adapted into Hungarian: *Electrochemical Nomenclature* (R, 1973); *Electrode Reaction Orders, Transfer Coefficients and Rate Constants* (R, 1979), *Nomenclature for Transport Phenomena in Electrolytic Systems* (R, 1979); *Interphases in Systems of Conducting Phases* (R, 1985); *The Absolute Electrode Potential: an Explantory Note* (R, 1986); and *The Electrochemical Corrosion Nomenclature* (R, 1988).

The next important task is to adapt in Hungarian *Nomenclature of Inorganic Chemistry: Recommendations 1990*. Hungarian representatives on IUPAC commissions greatly assist in such work.

Finally, I have to confess that, at the start, chemists were not keen on uniform nomenclature because each had their own practice and did not want to change it. However, teachers and editors supported the work because it meant they had standards to follow. Eventually, resistance disappeared as the advantages of uniform international nomenclature became apparent.

Nomenclature activity also induced linguistic efforts. In adapting nomenclature recommendations, rules of Hungarian chemical orthography were formulated. Without them, it was not possible to name chemical compounds. As a result of this work, a dictionary of chemical orthography was published in 1982. This dictionary contained the IUPAC names of about 6000 inorganic and organic compounds. Following this example, a technical orthographic dictionary was compiled in 1990.

Officers

At the end of the Council meeting at the Hamburg General Assembly, Prof. Allen Bard (USA), took over the Presidency of the Union for the period 1991–93. He succeeded Prof. Yves Jeannin (France) who is now Past-President of IUPAC.

Bard was born in 1933. He received his early education in the public schools of New York City and attended The City College of New York where he received a BS suma cum laude in 1955. He did his graduate work at Harvard University with J. J. Lingane and obtained an MA (1956) and PhD (1958) in electroanalytical chemistry. In 1958 he joined the faculty of The University of Texas at Austin where he currently holds the Norman Hackerman/Welch Regents Chair in Chemistry.

His involvement with IUPAC has included service as Vice-Chairman and Titular Member of the IUPAC Commission on Electrochemistry and as a Titular Member of the Commission on Chemical Kinetics. Bard is currently Chairman of the US National Committee.

His research interests have been in the application of electrochemical methods to the study of chemical problems and include investigations in electro-organic chemistry, photochemistry, electrogenerated chemiluminescence, and electroanalytical chemistry. He has published two books and 450 papers and chapters while editing the series *Electroanalytical Chemistry* (16 volumes) and the *Encyclopedia of the Electrochemistry of the Elements* (16 volumes). He is currently editor-in-chief of the *Journal of the American Chemical Society*.

Bard is an elected member of the National Academy of Sciences and Past Chairman of the Board on Chemical Sciences and Technology of the National Research Council.

In Hamburg, Council voted Prof. Heinz Staab as IUPAC Vice-President (President-Elect) for the period 1991–93. He will then take over the Presidency from Prof. Allen Bard. Staab is Director of the Department of Organic Chemistry, Max-Planck Institute for Medical Research, Heidelberg, Germany. A profile of the Vice-President was published on pages 126–7 of the July 1991 issue of the magazine.

Professor Gerrit den Boef (Netherlands) was elected Secretary General for the term 1991–95. He succeeded Prof. Tom West in this office following the Hamburg General Assembly.

Den Boef was born on 1 May 1926. He studied at the University of Amsterdam (1945–52) and in 1958 obtained his PhD with a thesis on 'Determination and application of kaliummanganate.' He has since published approximately 110 papers in international scientific journals.

Den Boef was Professor of Analytical Chemistry at the University of Amsterdam (1970–90) and President of the Faculty of Sciences (1970–74). He was Prorector of the University of Amsterdam (1974–76) and Rector Magnificus (1976–79). He was also President of the Chemistry Faculty (1948–87).

His other functions have included: Member of the Board of the Royal Netherlands Chemical Society (1965–67, 1981–83); President of the Royal Netherlands Chemical Society (1982); and Member of the Advisory Boards of *Analytica Chimica Acta* (since 1972), *Mikrochimica Acta* (since 1978), *Comprehensive Analytical Chemistry* (since 1978). *Fresenius Journal of Analytical Chemistry* (since 1983) and *Pure and Applied Chemistry* (since 1989). He is also an Honorary Member of the Austrian Society for Analytical and Microchemistry.

From 1977 to 1979 den Boef was a Member of the IUPAC Commission on Analytical Methods and Reagents (V.1) and Secretary of the Commission from

From left: Prof. Allen Bard (President), Prof. Heinz Staab (Vice-President/President-Elect), Prof. Gerrit den Boef (Secretary General) and Prof. John Ward (Treasurer).

1979 to 1983. He was Secretary of the Analytical Chemistry Division (1983–89) and President of the Division (1989–91).

Prof. John Ward (UK) was elected unopposed as Treasurer of the Union. He commenced his 4-year term of office on 1 January 1992 succeeding Prof. Anders Björkman (Denmark) who had held the office for two full terms (8 years). A profile of Ward appeared on pages 127–8 of the July 1991 issue of *CI*.

Bureau members

Professors Mihaly Beck (Hungary), Joshua Jortner (Israel) and Giorgio Modena (Italy) were re-elected as Bureau members for a further 4-year period by Council at the Hamburg General Assembly. Professor Animesh Chakravorty (India) was also elected as a member of Bureau for a 4-year term. Profiles of Beck, Chakravorty and Modena appeared on pages 127–130 of the July 1991 issue of *CI*. Jortner's profile was published on pages 158–9 of the July 1987 issue of the magazine.

Journal exchange among developing countries

The Chemical Society of Ethiopia has recently undertaken a project to establish a database of chemistry journals published in developing countries. The database, which will be set up under UNESCO's micro CDS/ISIS software will provide an inventory of such journals together with bibliographic data, information on content, editorial policy, price and availability through exchange. The project is financed by UNESCO.

It is realized that journals published in developing countries are often under-appreciated and under-used. However, they are not only particularly relevant to the needs of other developing countries; they may often be obtained under favourable conditions.

The project has two principal aims:

- to promote access to journals through exchange and/or subscription;
- to promote the use of journals of developing countries by scientists wishing to publish their research results.

National chemical societies which publish chemistry journals and other publishers of such journals in developing countries interested in the above project are kindly requested to contact: *Berhanu M. Abegaz, Editor, Bulletin of the Chemical Society of Ethiopia, PO Box 32934, Addis Ababa, Ethiopia.*

We regret to record the death of

Dr Y. Mashiko, Japan (20 September 1991) — Commission on Physicochemical Measurements and Standards (1963–83).

Nominations for the Ewald Prize invited

The International Union of Crystallography invites nominations for the Ewald Prize for outstanding contributions to the science of crystallography. The prize is named after Prof. Paul P. Ewald, in recognition of his significant contributions to the foundations of crystallography and to the founding of the International Union of Crystallography.

The prize consists of a medal, a certificate and a financial reward, and is presented once every 3 years during the triennial International Congress of Crystallography. The third prize, for which nominations are invited, will be presented at the 16th International Congress in Beijing, China, in August 1993.

Scientists who have made contributions of exceptional distinction to the science of crystallography are eligible for the Ewald Prize, irrespective of nationality, age or experience. The Selection Committee will give careful attention to the nominations of outstanding scientists who have not yet won a major prize. The prize may be shared by more than one contributor, but not more than three, to the same scientific achievement.

Nominations for the Ewald Prize should be submitted in writing, preferably using the Ewald Prize nomination form and accompanied by supporting documentation, to the Executive Secretary of the International Union of Crystallography, 5 Abbey Square, Chester CH1 2HU, UK, from whom copies of the nomination form, the names of the Selection Committee and advice on the submission of nominations may be obtained. The closing date for nominations is 31 August 1992.

Study Abroad

The 27th edition of the UNESCO publication *Study Abroad* has been published. This guide contains 2846 entries concerning post-secondary education and training in 124 countries including details of scholarships, financial assistance and employment for students. Practical information includes: admission requirements, duration of courses, fees, cost of living, useful addresses and bibliography.

Study Abroad (27th edition, 1991, pp. 1278, ISBN 92-3-002715-4, price FRF 92.- including packing and shipping costs) may be ordered from a national distributor of UNESCO publications or from UNESCO Press, Sales Division, 7 place de Fontenoy, 75700 Paris, France. (Tel: +33 (1) 45 68 10 00. Telex 204461. Fax: +33 (1) 42 73 30 07). UNESCO accepts orders accompanied with payment by a bank cheque or postal money order made out to the UNESCO PRESS. Any banking charges incurred in processing a cheque will not be borne by UNESCO.

Nomenclature of electron-transfer proteins

'Nomenclature of electron-transfer proteins: Recommendations 1989' issued by the Nomenclature Committee of the International Union of Biochemistry (NC-IUB) was published in *Eur J Biochem*, Vol. 200, pp. 599–611, 1991. The recommendations were first drafted by Graham Palmer, Rice University, Houston. Texas, USA and then extended and prepared for publication by Jan Reedijk, Leiden University, The Netherlands.

The document has 11 sections: 1. General introduction; 2. Flavoproteins; 3. Proteins containing reducible disulfide; 4. Cytochromes; 5. Non-heme iron proteins; 6. Copper proteins; 7. Molybdenum proteins; 8. Nickel proteins; 9. Vanadium proteins; 10. Quinoproteins; 11. Metal-substituted metalloproteins.

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairpersons and secretaries and IUPAC officers were published in the November 1991 issue of *CI* (Vol. 13, No. 6, pp. 223–233). The IUPAC Secretariat has been notified recently of the following appointments, additions and changes:

Prof. A. Hulanicki (President, Analytical Chemistry Division). Telex: 825439 UWPL.

Prof. K. V. Sané (Chairman, Committee on Teaching of Chemistry). Tel: +91 (11) 292 1161.

Dr J. Stejskal (Secretary, Commission on Polymer Characaterization and Properties). Ústav Makromolekulární Chemie, Ceskoslovenská Akademie Ved, Heyrovského náměstí 2, CS-162 06 Praha 6, Czechoslovakia. Tel: +42 (2) 368 041. Telex: 122019 IMCP C. Fax: +42 (2) 367 981.

Commission & Committee News

Hamburg

The following are reports of some of the commission and committee meetings which took place at the 36th IUPAC General Assembly in Hamburg in August 1991. They were submitted as 'Summary Minutes' by the chairman or secretaries of these bodies. More reports will appear in the next issue of the magazine.

Chemistry and industry

The Chairman of the IUPAC Committee on Chemistry and Industry (COCI), Dr Dieter Wyrsch, welcomed committee members and observers from Malaysia and USSR to their meeting in Hamburg.

The committee learnt that the proceedings of the 1st IUPAC Workshop on Safety in Chemical Production, held in Basel, Switzerland, September 1990, were planned for publication at the end of 1991. Those wishing to order a copy should contact one of the COCI officers: Chairman, Prof. Albert E Fischli, Pharma Division, Preclinical Research, F. Hoffman-La Roche Ltd, CH-4002 Basel, Switzerland; Secretary, Dr Rene-Paul Martin, Director of Innovation, Societe Nationale Elf Aquitaine, Tour Elf Cedex 45, F-92078 Paris-La Defense, France.

As a spin-off from the Basel workshop, COCI has become involved in national workshops on safety in chemical production, one of which was planned to start its activities in Beijing, China in October 1991. Due to COCI's assistance, it was possible to delegate three internationally renowned experts as plenary lecturers for this workshop.

In collaboration with the United Nations Industrial Development Organization (UNIDO) in Vienna, COCI is envisaging the creation of training centres for safety education in the Third World. The aim is to search for possibilites of setting up a global network of such training centres. Feasibility studies are underway.

The 2nd IUPAC Workshop on Safety in Chemical Production will take place from 31 May to 5 June 1993. The venue will be the International Convention Hall, Yokohama City, Japan. Prof. K. Tamaru, former President of the Chemical Society of Japan will chair the organizing committee. The first circular should be available in early 1992. As with the first workshop, opportunities will be provided for hands-on experience of the study of safety problems within the factories. Several companies located in the Kanagawa prefecture declared an interest in contributing to the workshop. A number of case studies will also be carried out on safety problems relating to the manufacture of selected biotechnological products.

COCI has proposed that the 75th anniversary of IUPAC be celebrated under the leitmotif 'Chemistry for life.' During 1994, COCI would be delighted to see a large majority of IUPAC bodies addressing the scientific and lay public with IUPAC events under this heading.

The next COCI meeting will take place in Stockhom, Sweden on 5 September 1992.

Prof. Albert E Fischli

COCI proposes the theme 'Chemistry for life' for the 75th IUPAC anniversary celebrations in 1994.

CTC publications on key chemistry topics

At its meeting in Hamburg on 5–6 August 1991, the committee on Teaching of Chemistry (CTC) agreed to initate development of a series of background publications on key chemistry topics for secondary and tertiary teachers. Each 100-page volume will present a contemporary overview of the development and current status of a particular chemistry topic, followed by reprints of classic papers related to the topic. Development of an initial volume on chemical bonds will be coordinated by Prof. Ronald Gillespie (Canada).

Planning has started on a CTC-sponsored international workshop on small-scale techniques for chemistry laboratory teaching. The workshop, tentatively scheduled for 1992, will invite international leaders in small-scale experimental work for chemistry students to share ideas and plan follow-up regional activities supporting innovations in small-scale laboratory teaching.

IUPAC Divisional and Section collaborations with CTC continue to grow. Joint projects either under discussion, planned, or underway include publications addressing contemporary chemistry topics, new laboratory activities, and perspectives on experimentation and measurement; jointly sponsored conferences; and other initiatives of common interest.

Instructional resources for secondary school chemistry on the theme *Burning of Fuels*, drafted at a UNESCO–CTC-sponsored 1989 conference in Berkeley (USA), have been tested and reviewed in over 20 nations. A monograph on these materials, their development, and evaluation will be ready for publication later this year. Comparable teaching resources on *Water Quality and Human Activity*, developed at the 11th ICCE (see below) with CTC sponsorship, will be tested and evaluated in 1992.

A CTC subcommittee continues work on draft materials for teachers on definitions and proper use of selected chemical concepts, consistent with IUPAC recommendations. This work will be coordinated with the IUPAC Publication Commitee's proposals for a student-orientated nomenclature book.

Locally Produced Low Cost Equipment for the Teaching of Chemistry, coauthored by K. V. Sané and D. C. West, was published this year by the university of Delhi. The book features work done in the 10-year CRC–UNESCO locally produced equipment project directed by Prof. Krishna Sané (India).

Plans to insure the impact and financial viability of the *International Newsletter on Chemical Education* (INCE) were approved by CTC, including selling sets of all 34 past issues, soliciting paid INCE library subscriptions, and — while still offering free subscriptions to all those desiring it — accepting token voluntary subscriptions from individuals willing to pay. In addition, major national chemical societies will be invited to make regular biennial contributions to INCE.

Prof. Pirawan Bhanthumnavin will chair the Organizing Committee of the 12th ICCE to be held in Bangkok, Thailand on 17–21 December 1992.

The 12th International Conference on Chemical Education (ICCE), organized by CTC and The Chemical Society of Thailand in cooperation with UNESCO, will be held in Bangkok Thailand on 17–21 December 1992. This conference, following a successful 11th ICCE at the University of York, UK, in August, will be chaired by Prof. Pirawan Bhanthumnavin. Looking further to the future, the 13th ICCE will be held in Puerto Rico in August 1994.

The next meeting of the Committee on Teaching of Chemistry will be held in Enschede, The Netherlands on 31 August–1 September 1992.

Prof. Henry Heikkinen

Guidelines for database procedures

The IUPAC Committee on Chemical Databases (CCDB) met at the Hamburg General Assembly on 9–11 August 1991. The Committee has prepared a draft of administrative database procedures guidelines for divisions, commissions and committees to use in the development of database projects. This draft will be circulated to the appropriate IUPAC bodies for comment and then sent to the IUPAC Bureau for consideration.

Considerable progress was made with the Commission on Solubility Data (V.8) on the solubility database. CCDB is now waiting for a written proposal so that development of this database can begin.

The Publications Committee database of IUPAC recommendations has progressed to a point where it should be ready for distribution within less than 12 months.

The database on stability constants of the Commission on Equilibria Data (V.6) is progressing smoothly. The goal is to have the first release of this database available by the end of 1992.

CCDB has prepared draft guidelines for the procedures to be used for the development of IUPAC database projects.

Discussions were undertaken with the Interdivisional Committee on Nomenclature and Symbols (IDCNS) as to how CCDB could assist the computerization activities associated with updating the *Compendium of Chemical Terminology* (the Gold Book) in 1993. Discussions were also initiated on a possible NMR database and CCDB is waiting for the Commission on Molecular Structure and Spectroscopy (I.5) to report on this matter.

CCDB met with the Commission on Thermodynamics (I.2) who expressed considerable concern with copyright and ownership of databases from their Commission. This topic will be brought to the attention of Bureau.

Considerable progress has been made in the development of the SMD chemical structure exchange format. This work has been undertaken in cooperation with ASTM and the UK Chemical Structure Association.

The next meeting of CCDB will take place in London, UK, on 8 December 1991.

Dr Clemens Jochum

Transport properties

The Subcommittee on Transport Properties of the Commission on Thermodynamics (I.2) met 8–10 August 1991 during the Hamburg General Assembly. Fourteen scientific presentations were made on specific topics related to the three ongoing projects of the subcommittee.

Standard Reference Data for the Transport Properties of Fluids. Dr J. H. Dymond and Prof. H. A. Oye outlined the results of their critical evaluation of viscosity data along the saturation line for a number of normal alkanes. They concluded that the available data did not justify an uncertainty lower than $\pm 0.5\%$. This was deemed inappropriate for standard reference data and it was agreed that further experimental work was required in this area.

MIDAS Databank of Transport Property Data. A comparison of the values of the transport properties included in this databank for the proposed environmentally acceptable refrigerants displayed discrepancies of as much as 100% between the results of various workers. It was agreed that this worrying situation should be publicized and further more careful work encouraged.

Transport Properties Data Book. It was agreed that there was a need for a text to describe the theory and the methods of transport property estimation correlation and prediction procedures, as well as standard reference values to test the methods. The proposed editors were Prof. C. A. Nieto de Castro, Dr J. Millat and Dr J. H. Dymond.

Prof. W. A. Wakeham

Applications of data evaluated by the Subcommittee on Gas Kinetic Data Evaluation for Atmospheric Chemistry include calculations of acid deposition created from photo-oxidation of SO_2 emitted into the troposphere.

New data evaluation for atmospheric chemistry

The Commission on Chemical Kinetics (I.4) held its 4th meeting in Hamburg under the chairmanship of Prof. E. T. Denisov (USSR).

The fifth draft of the 'Glossary of terms used in chemical kinetics including reaction dynamics' prepared by Prof. Laidler (absent from the meeting) was discussed in detail. A final draft including some modifications was prepared for typing at the meeting and will be submitted as soon as possible for consideration by IUPAC and possible merger with the glossaries of the Commissions on Photochemistry (III.3) and Physical Organic Chemistry (III.2).

The fourth and 'final' draft of the report 'Kinetics of composite reactions in closed and open-flow systems' prepared by Prof. Villermaux (absent from the meeting) was also presented. Unfortunately, it was noted by Prof. Alberty that this document contained inconsistencies with IUPAC recommended nomenclature and it was decided to refer it back to Prof. Villermaux for his consideration.

The Subcommittee on Gas Kinetic Data Evaluation for Atmospheric Chemistry (Chairman, Prof. Kerr) has prepared a major updated and extended evaluation of kinetic and photochemical data for atmospheric chemistry. The database consists of data sheets for some 460 elementary gas-phase reactions which are important in modelling the chemistries of both the stratosphere and the troposphere. Areas of application of the data include calculations of ozone depletions in the stratosphere arising from emission of CFCs and HCFCs, as well as calculations of acid deposition created from the photo-oxidation of sulphur dioxide emitted into the troposphere.

The manuscript of the data evaluation (1200 typed pages) — submitted in computer format to the *Journal of Physical and Chemical Reference Data* in October 1991 — and a summary of the reactions and recommended rate data will be published ahead of the main articles in *Atmospheric Environment*.

The following future projects were discussed by the commission:

1. *Computer databases in chemical kinetics*. This project is nearing fruition following the successful meeting held in Novosibirsk in May 1991. The output from this project will be transmitted to the Committee on Chemical Databases (Prof. Marsh).
2. *Ultrafast reactions*. This project is still on-going and it is hoped to make a contribution to the series of books on *'Chemistry and the 21st Century.'*
3. *Kinetic and photochemical data evaluation for atmospheric data*. The commission strongly recommends the continuation of the work of the subcommittee involved with this project and is pleased to note the support which has been earmarked for the project from the Coordinating Committee on Chemistry and Environment Programme for the biennium 1992–93.
4. *Energetics of free radicals and activated complexes*. The commission recommends the initiation of a new activity on the theoretical computation of the properties of free radicals and activated complexes. The energetics of their species are the key elements in developing methods for the prediction of kinetic data for the complex systems encountered in environmental combustion and materials science.

J. A. Kerr

Molecular structure and spectroscopy

At Hamburg, the Commission on Molecular Structure and Spectroscopy (I.5) decided to review its present activities against the background of the present restructuring process. Further incentives for this were furnished by the 'hot spots' activity in the Physical Chemistry Division, as well as by the request of the Bureau to investigate the possibility of amalgamating with the Commission on Spectrochemical and Other Optical Procedures for Analysis (V.5).

Two very lively brainstorming sessions indicated clearly that the Commission had concentrated its attention almost solely on aspects of *molecular spectroscopy*. The Commission concluded that it is essential to extend its activities also into the field of *molecular structure* (including quantum chemistry). In addition, it was found that attention should be given to a group of concepts which can, in a sort of general way, be described by the term *instrumentation* (data collection and manipulation, hardware and software, and so on).

The Commission decided that:

- the membership of the Commission should reflect the new directions starting in 1991 and that appropriate new members should be appointed in 1991, 1993 and 1995;

- plans should be made for 1991, 1993 and 1995 to phase in the new projects;
- a project dealing with the concept of molecular structure should be started now as a first step;
- a project on specifications for IR spectra of compounds at elevated temperatures must be started;
- two working parties (NMR Computerized Databases; Referencing and Standardization of Multinuclear Magnetic Resonance Data) were disbanded; the projects and the people involved are kept on lists;
- by 1993, all working parties and subcommittees will be phased out as instructed by the Bureau and their projects completed.

Dr Grenda Winneweisser became a Titular Member and Chairperson of the Subcommittee on Notations and Conventions, and Profs Boris Derendjaev and Alex Bradshaw became Associate Members after their 8-year terms had expired.

The usual activities of the Commission received their full attention and several projects were finalized.

Prof. Casper Schutte

Colloid and surface chemistry including catalysis

The Commission on Colloid and Surface Chemistry including Catalysis (I.6) completed the following three projects during the period 1989–91:

1. A survey of experimental techniques in surface chemical physics.
2. Interfacial electrochemical data for disperse systems.
3. Manual on catalyst characterization: terminology.

All three projects were published in *PAC*.

In addition, the 'sister' project to (3) — 'Manual on catalyst characterization: methodology' together with the projects on characterization of porous solids and thin films are nearing completion and should be ready to send to experts and the Interdivisional Committee on Nomenclature and Symbols (IDCNS) shortly.

Feasibility studies on two new projects have been successfully completed and, as a result, the following two new sub-committees have been set-up to oversee these projects:

1. Environmental protection: surface, colloid and catalytic aspects.
2. Advanced materials: colloid, surface and catalytic aspects.

Both these projects are in line with the horizontal project concept initiated at Lund in 1989.

Dr Brian Vincent

Prof. Kozo Kuchitsu.

Physical chemistry 'hot spots'

Chairmen of the Physical Chemistry Division met for three sessions on 7 August 1991 in Hamburg. Division President Prof. G. M. Schneider summarized developments within the Union and the Division for the biennium. The Nominating Committee, chaired by Prof. G. Somsen prepared a list of candidates for election as members of the Division Committee. Division Secretary, Prof. K. Kuchitsu presented this list and described the procedure for elections.

Members discussed the possibility of restructuring the Division and initiating new programmes with reference to: (1) the review of Division projects by Division Vice-President, Prof. R. A. Alberty, (2) the biennial report of the Division President and (3) the critical assessment of IUPAC Vice-President, Prof. A. J. Bard. IUPAC Treasurer, Prof. A. Björkman visited the evening session and outlined the financial problems of the Union.

During the same evening and the Division's first open meeting on 8 August, Prof. Kuchitsu summarized the report of the Working Party on Hot Spots in Physical Chemistry. This working party, chaired by Prof. Kuchitsu, was set up within the Division after the Lund General Assembly to study how the Division could best keep up with and contribute to the rapid development of various frontier areas in physical chemistry by active international and interdisciplinary collaboration.

The report indicated a number of hot-spot areas not sufficiently represented by the current activities of the Division. These included: quantum chemistry and computational chemistry, reaction dynamics of molecules, clusters and surfaces, and physical chemistry under extreme conditions.

After the discussion, the Division Committee decided to initiate a project entitled 'Hot Spots in Physical Chemistry' in an attempt to incorporate hot-spot areas into the work of the commissions, to recruit experts in such areas into the Division's activities and to promote intercommission and interdivisional activities in related fields.

At the second open meeting on 10 August, Prof. Cvităs made a progress report on the new edition of the Green Book. Prof. G. Gritzner also made a suggestion for a new reviewing procedure to speed up publication of IUPAC recommendations on nomenclature.

On 11 August, chairmen of working parties and subcommittees presented their reports. The Working Party on Theoretical Chemistry, chaired by Prof. R. D. Brown, was initiating a project on a list of acronyms in quantum chemistry. The Subcommittee on Reference Materials in Chemistry, chaired by Mr S. D. Rasberry, set up an exhibition stand at the Hamburg General Assembly for display of international catalogues and COMAR — the database of available reference materials. The Steering Committee on Biophysical Chemistry, Chaired by Prof. I. Wadsö, will continue to be active in the next biennium as one of the core IUPAC activities representing this discipline. Representatives on other bodies were nominated in this session.

On 12 August, chairmen of all six Division commissions presented their proposals for new projects and future membership as a result of careful consideration of 'hot-spots' and on the two mission-orientated programmes of the Union. The Division Committee decided to initiate in the Commission on Colloid and Surface Chemistry including Catalysis (I.6) two subcommittees related closely to the mission-orientated programmes and at the same time disband three subcommittees and two working parties attached to division commissions.

In this biennium, an informal liaison had been assigned to each member of the Division Committee with one or two Division bodies to promote mutual communication. It was agreed to continue this scheme for the next biennium and Prof. Alberty was asked to assign the responsibilities to the members.

The next meeting of the Division Committee will be held during the 37th General Assembly in August 1993.

Prof. Kozo Kuchitsu

Inorganic chemistry

The Inorganic Chemistry Division Committee, at its meeting in Hamburg, reviewed the work of the various Commissions during the previous biennium. All three Commissions have been very active.

The Commission on Atomic Weights and Isotopic Abundances (II.1) has continued with its routine work on the revision of atomic weights. Its archives, which date back to 1890, are being transferred to the Museum of the History of Chemistry, Philadelphia, USA. It is trying to finalize a set of definitions of terms currently understood by the words 'atomic weight', which will satisfy a wide range of conflicting requirements.

The Commission on the Nomenclature of Inorganic Chemistry (II.2) is well ahead with the preparation of Volume 2 of *Nomenclature of Inorganic Chemistry* (Red Book 2) with eight chapters in an advanced state of preparation. It is hoped to publish Red Book 2 by the end of 1995. The scope of Red Book 3 is currently being defined.

The Commission on High Temperature and Solid State Chemistry (II.3) has an extremely heavy work load and is currently finalizing four documents. It is preparing a computerized database of elemental thermochemical data and is also involved with the Committee on Teaching of Chemistry.

The Division also has a Limmited Life Time Commission on Isotope Specific Measurements as References. This very active LLTC programme is of the greatest significance for the establishment of absolute references for many kinds of quantiative determination.

The Division has agreed that the Bureau should be asked to ratify amendments to the Division bylaws 4(a) and 4(d). These would have the effect of enabling the President to ask that the length of service of Division Committee members be extended in order to maintain a proper balance between incoming and continuing members, and to avoid the positions of 1989, when there were no vacancies, and of 1991, when there could have been seven (out of a membership of eight). The changes also make clear that members-elect would be eligible for election as Officers of the Division.

The implications of the Union's financial difficulties were discussed. It was clear that activities would need to be curtailed. Specifically, no further money would be available for the Bioinorganic Glossary, but other cuts and restrictions would also be necessary. Final decisions on the budget for 1991–93 were not made before the end of the meeting, and the consequences for the work of the Division remain to be clarified.

The next meeting of the Division Committee will be held at the IUPAC General Assembly in Lisbon, Portugal in 1993.

Prof. G. J. Leigh

New thrust in advanced materials

The main objectives of the Coordinating Committee on Chemistry of Advanced Materials are to provide the necessary focus for programmes related to advanced materials in the IUPAC community, to identify lacunae and new areas and to promote interdivisional collaboration.

At its meeting in Hamburg, the committee decided to bring out a publication on the on-going programmes of the Union on advanced materials. Besides suggesting projects for interdivisional collaboration, the committee has identified new areas such as cluster chemistry, smart materials, composites, chemical vapour deposition and Langmuir–Blodgett films.

A workshop on chemistry and ceramics is planned to be organized through the IUPAC Commission on High Temperature and Solid State Chemistry (II.3). An interdivisional discussion meeting on advanced materials will be held at the time of the next general assembly at Lisbon to bring an awareness of the IUPAC activities in this area amongst the different divisions. It is also proposed to cooperate with the IUPAC Committee on Teaching of Chemistry (CTC) in bringing out a survey on the teaching of chemistry of materials.

C. N. R. Rao

Compilation of photochemistry experiments

The Commission on Photochemistry (III.3) compiled a set of 13 simple experiments in photochemistry intended for undergraduates when it met during the General Assembly in Hamburg. The experiments were selected by former titular member K. Tokumaru (Japan) from those submitted by experts around the world. Current titular member J. Coyle (UK) edited this compilation. Publication for distribution around the world is being pursued with the IUPAC Committee of Teaching of Chemistry.

In other work at Hamburg, Commission III.3 finalized a list of terms on photo-induced electron transfer terms to supplement the previously published 'Glossary of terms used in photochemistry' (*PAC*, Vol. 60, No. 7, pp. 1055–1106, 1988).

New projects were intiated on analysis of transient absorption kinetics data and on recommended protocols for reporting experimental results on water treatment using radiation including light.

The commission will meet next on the occasion of the IUPAC sponsored 14th International Symposium on Photochemistry to be held in Leuven, Belgium on 19–25 July 1992.

David F. Eaton

50 Solubility data volumes

Since its formal establishment within the Analytical Chemistry Division 12 years ago, the Commission on Solubility Data (V.8) has maintained a steady output of publications in a series which will reach 50 volumes within the next year.

The work of the Commission continues with four new projects being proposed for approval at the Hamburg General Assembly. Progress has also been demonstrated on the conversion of the written record into an automated database. Criteria for describing the data record were discussed and agreed upon.

Five volumes of the *Solubility data series* will have their data transferred into a pilot model and approval for inclusion of all the data in the series will be sought in a formal proposal to the Committee on Chemical Databases after the pilot model proves satisfactory.

Involvement by the membership of the Commission in sponsoring future symposia in solubility phenomena continues and prospective sites for symposia in 1994 and 1996 have been established.

The next Commission meeting will be held in Moscow, Russia on 6–7 July 1992 just prior to the 5th International Symposium on Solubility Phenomena.

Dr L. H. Gevantman

Medicinal chemistry for the 21st Century

When the Section on Medicinal Chemistry met during the Hamburg General Assembly, Section President Prof. C. G. Wermuth summarized all the section's activities that had occurred since the previous assembly in Lund. He expressed his gratitude to the section members for their support and effort.

The book *Medicinal Chemistry for the 21st Century*, which constitutes a part of the 'Chemistry for the 21st Century' is nearly complete. So far, manuscripts had been received from 21 of the 29 contributors.

The section and the Commission on Biotechnology (VI.2) held two joint meetings (in August 1990 and August 1991). A common working party was created and a decision was made to hold a joint symposium at the 12th International Symposium on Medicinal Chemistry, Basel, 1991.

Efforts to initiate the Asian Federation of Medicinal Chemistry continued: the Pharmaceutical Society of Japan has set up a Medicinal Chemistry Division and three societies in China and Korea had agreed to support plans to initiate AFMC. Fifteen societies from 13 other countries wil be approached again.

The Section will next meet in Tokyo, Japan in October 1991.

Dr Naofumi Koga

The Section on Medicinal Chemistry at its meeting in New Delhi, February 1990. From left: Dr Naofumi Koga (Secretary), Prof. Robert G. Glushkov, Prof. Camille-Georges Wermuth (President), Prof. Horst König, Dr Brian W. Metcalf (Vice-President) and Dr A. V. Rama Rao.

Workshop planned for Thailand in 1992

Plans are underway for a joint meeting in Bangkok, Thailand on 4–7 November 1992 involving the Commission on Agrochemicals (VI.5), the Thai Department of Agriculture and other Thai scientists involved in agrochemicals. Regional scientists will be invited. The theme is 'Assessment and management of risks from pesticide use in South East Asia.' ICSU (International Council of Scientific Unions) funding has been obtained and aid agencies will also assist.

The commission made major progress on its nine current projects at its meeting in Hamburg. Five of these projects are at the draft report stage and will be finalized for publication in the next year.

The project on modelling of pesticide transport by leaching or run off was assisted by a visit and talks by Dr Wilfried Pestemer and his student Heinrich Dibbern of the BBA, Braunschweig.

Meetings were held with the Commissions on Biotechnology and Water Chemistry to discuss joint projects. Commission VI.5 contributed to a workshop by the Commission on Water Chemistry. The topic of the workshop, which was held in Hamburg on 13–14 August, was 'The behaviour of pesticides in water catchments'.

New commission members are: Denis Hamilton (Australia), Bill Murray (Canada) and Bernd Zeeh (FRG). They bring diverse geographical and chemical experience to the commission.

The next meeting of the commission will be held immediately prior to the Thailand workshop, Bangkok on 1–3 November 1992.

Dr Patrick T. Holland

Compendia on quantities and units in clinical chemistry

In Hamburg, IUPAC Executive Secretary Dr Mo Williams encouraged the Commission on Quantities and Units in Clinical Chemistry (VII.2) to collaborate in the preparation of a compendium of Clinical Chemistry Division recommendations published under the aegis of IUPAC and IFCC (International Federation of Clinical Chemistry) since 1968.

The Division VII member of IDCNS (Interdivisional Committee on Nomenclature and Symbols), Mr J. Christopher Rigg, will initiate and survey the project and seek collaboration with the scientific division of IFCC. In addition to the already published recommendations (approximately 10), it might include nearly finalized projects on quantities and units for: (a) metabolic processes as a function of time; (b) centrifugation; (c) electrophoresis; and (d) WHO biological materials for diagnostic use. The 'Glossary of terms on quantities and units in clincial chemistry' (about 90 pages) and the 'Glossary of terms used in toxicology' (about 121 pages) would form separate compendia.

Eric Dorn (left), Chairman of the Commission on Agrochemicals, with Commission Secretary Pat Holland in Hamburg.

During the meeting, Commission VII.2 was pleased to learn that its project on 'Nomenclature of derived quantities' (Recommendations 1991) was in press and now ready for publication (see *PAC*, Vol. 63, No. 9, pp. 1307–1311, 1991). This general recommendation within new terms accepted by ISO/TC 12 is considered of importance beyond clinical chemistry.

At a joint meeting with the Commission on Toxicology (VII.4) the kind of quantity, amount-of-substance concentration instead of mass concentration for 'trace metals' was agreed upon and a feasibility study on cut-off limits for toxic substances in the environment is to be initiated by Mr Birger Hein (Commission VII.4). In support of this, Dr Gilbert Hill (Commission VII.2) will look into the correct statistical presentation of numercial values of intervals and limits of legal importance.

In the project on 'Quantities and units in clinical laboratory sciences,' there is an ongoing exchange of views with a series of interested parties such as various IFCC committees, international medical societies and some national societies on clinical chemistry.

The next meeting of the commission will take place in Copenhagen, Denmark, 8–11 April 1992.

Fundamental assessment of DSC started

The lack of meaningful understanding of the results of differential scanning calorimetry (DSC) on polymers was recognized by the Working Party on Thermal Properties of Polymers. A feasibility study led to a proposed programme to establish the thermodynamic validity of DSC experiments. This was welcomed and approved by the Commission on Polymer Characterization and Properties when it met in Hamburg. The working party will initially tackle thermoplastics.

It was partly due to recently completed work on assessing cure by DSC that the present inadequacy of understanding was revealed. This work will soon be published and will clearly show the near intractability

of the use of DSC for curing systems and the difficulty of obtaining consistent results let alone ones where their meaning can be understood in thermodynamic terms.

Another contribution to identification of the need for a fundamental programme was the chaos of results for liquid-crystal polymers reported at the Montreal commission meeting (see *CI*, Vol. 12, No. 6, p. 226, 1990). Happily, close analysis of those results has begun to show a greater measure of compatibility than at first appeared.

Of the long-established working parties, that on 'Structure and properties of commercial polymers' is still very active. Two papers are in preparation for publication and work on a further two nearing completion from the major programme of work on continuous carbon fibre — PEEK composites. Work on rheology of liquid crystal polymers and structure vs. properties of discontinuous fibre reinforced plastics is nearly complete.

A new project to readdress the still vexed subject of rubber toughening of plastics was approved by the commission. With the techniques and understanding now available the time is right to tackle this subject and expect definitive results.

While the working parties have not had sufficient time to complete their initial projects, there are nonetheless a significant number nearing the stage when publication will begin. For example, the Working Party on Polymer Networks is beginning preparations for publications on: 'Interpretations of formation, structure and properties of polyurethane networks'; 'Measurements of polyurethane networks'; a 'Critical survey of molecular theories'; and the 'Structure and properties of physical networks'.

The next commission meeting will be held in Prague, Czechoslovakia on 11 July 1992.

John M. Cann

Glossary of terms used in toxicology

When the Commission on Toxicology (VII.4) met 8–11 August 1991 during the Hamburg General Assembly, it was delighted with the outcome of the 5th revised draft of its working party's 'Glossary of terms used in toxicology'. This glossary contains about 1000 entries.

Dr John Duffus (who has been an IUPAC affiliate member since 1986) and the other members of his working party fulfilled the recognized need for globally acceptable definitions of terms used in toxicology, particularly for chemists whose skills are now being applied to toxicological problems and who require ready access to the relevant toxicological literature. The aim of the glossary is to satisfy this need by defining terms which occur frequently in the toxicological literature and with which chemists would normally not be familiar.

At Hamburg, Dr Rita Cornelis became Chairperson of the Commission of Toxicology.

Trace elements are still in business. Since its establishment in 1973, the commission has exhibited keen interest in trace elements, for example, most recently through the working party on evaluation and determination of human reference materials for quality assurance and harmonization of trace element determinations. An interlaboratory comparison of the determination of the trace elements Al, Cu, Se and Zn in serum and Cd, Hg, Pb and Se in whole blood, organized by Dr Yngvar Thomassen, proved very successful and may possibly result in 'master' or primary reference materials which may then serve to evaluate secondary reference materials for trace element analysis.

A very interesting manuscript was produced by Dr Douglas Templeton describing reference intervals for Ni in human body fluids. The working parties on setting criteria and guidelines for reference intervals, sampling collection and storage of body fluids for trace element determinations in biological monitoring benefitted to a large extent from the special meeting held in Copenhagen, 24–27 February 1991. Due to the fact that these two endeavours are closely related, it was decided to merge them. Dr Olef Vesterberg from Sweden is one of the key experts behind this project that will produce a working document with specific descriptions for Al, As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Se and Zn. Discussions on the calculation of expectation intervals with a given statistical confidence will lead to another working paper.

In a more specialized area, the development of a standardized method for the determination of Cd in urine, an effort headed by Dr R. Herber, concludes the description of the ambitious programme of the Commission on Toxicology in the field of trace element determination.

The planned cooperation of the commission with the Coordinating Committee on Chemistry and the Environment Programme will be crucial for the success of the lateral programmes on 'Quality assurance' and 'Speciation as applied to human health.'

Dr Rita Cornelis

Information for Affiliates

IUPAC Publications

Affiliates are entitled to a 25% reduction on the cost of all IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications together with an order form may be obtained from the IUPAC Secretariat.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

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Bank Court Chambers
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Fax: +44 (865) 747510
Telex: 83220 IUPAC G

Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC Progamme on Chemistry and the Environment* have been distributed to members of IUPAC commissions and committees, national adhering organizations and other bodies associated with IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Secretary.

IUPAC ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon or navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 88 of the July 1990 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

IUPAC-sponsored conferences

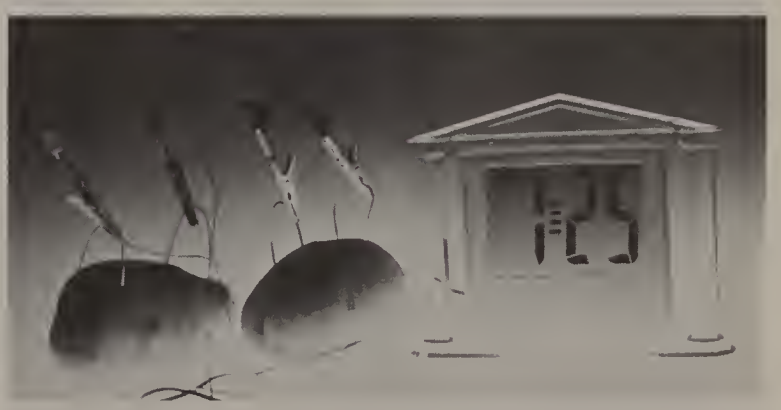
If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually — but not always — announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.



Liquid crystals

The electrical energy obtained from two galvanic elements in series — in this case two copper–iron electrodes stuck in potatoes — is sufficient to keep the watch liquid-crystal display and the control electronics running for more than 24 hours. Liquid-crystal applications is one of the topics to be considered at the IUPAC-sponsored 14th International Liquid Crystal Conference which will take place at Pisa, Italy in June this year (see page 79). Affiliates are entitled to a discount on the registration fee. (*Photo Roche.*)

Pure and Applied Chemistry (PAC) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Automation and new technology in the clinical laboratory

Plenary lectures presented at the 4th International Congress on Automation and New Technology held in Barcelona, Spain on 9–12 October 1990, are published in the August 1991 issue of *PAC*.

A paper on 'Modern aspects of fluorimetry as applied to clinical chemistry' by A. Gómez-Hens (University of Córdoba, Spain) deals with advanced aspects of fluorimetric techniques such as derivative synchronous fluorescence spectroscopy, laser-induced fluorescence spectroscopy, stopped-flow fluorescence spectroscopy. In this paper, Gómez-Hens discusses the potential of each of these techniques in the clinical laboratory and also compares modern fluorimetric techniques with conventional techniques in terms of sensitivity, selectivity, precision, automation and scope of application.

'Diagnosis of genetic diseases by DNA technology' was the topic of a paper by Maurizio Ferrari, Laura Cremonesi, Paola Carrera and Pierangelo Bonini (Milan, Italy). They point out that the development of recombinant DNA technology has allowed the study of the molecular pathology of inherited diseases in man. Two main molecular approaches have been employed: direct study for detection of molecular defects and indirect detection by linkage analysis. They add that a variety of new technologies and their applications have provided a powerful new tool in the diagnosis of inherited diseases.

The following are the topics of other plenary lectures published in this issue of *PAC*: trends in spectroscopic methods for clinical chemistry; gene amplification: present and future in the molecular diagnosis; oncogenes and cancer monitoring; molecular biology, measurement and clinical utility of the acute phase proteins; new technology in TDM and toxicology; resolution of chiral drugs; new trends for automation in immunoassays; new methods for the quantitation of microbial nucleic acids; latex agglutination procedures in immunodiagnosis; nephelometric immunoassay with shell/core particles; reference method, quality control and automation of reticulocyte count; chemical sensors and biosensors: nearer the patient.

'Molecular biology, measurement clinical utility of the acute phase proteins' was the topic of one of the plenary lectures presented at the Barcelona congress. (*Photo courtesy Hoechst AG.*)

Solid sampling Zeeman atomic absorption spectrometry

The September 1991 issue of *PAC* includes four plenary lectures presented at the 4th International Colloquium on Solid Sampling with Automatic Spectroscopy held in Jülich, FRG on 8–10 October 1990. The first of these is co-authored by J. Pauwels, L. De Angelis and K. H. Grobecker (Commission of the European Communities, Joint Research Centre, Central Bureau for Nuclear Measurements, Geel, Belgium) and entitled: 'Solid sampling Zeeman atomic absorption spectrometry in production and use of certified reference materials'.

The authors point out, in the abstract to their paper, that solid sampling Zeeman atomic absorption spectrometry (SS-ZAAS) was developed and commercialized some 10 years ago, and since that time a large number of applications have been published. However, in the process of production and certification of certified reference materials (CRMs), the method has never been fully accepted and, thus, was used only marginally. SS-ZAAS is, nevertheless, ideally suited for CRM production control purposes, and, moreoever, constitutes an interesting source of information on the micro-constitution of candidate CRMs.

In the process of certification, the major problem is the independent and absolute calibration of the method with calibrants matching the matrix of the analysis samples. For routine analyses most of the presently existing CRMs can be used for calibration purposes.

The other three plenary lectures published in this issue of *PAC* are:

- Statistical treatment of ETA-AAS (electrothermal atomization — atomic absorption spectrometry) solid sampling data of heterogeneous samples (Ulrich Kurfürst, University of Fulda, FRG);
- Solid sampling automatic absorption spectrometry and matrix composition of organic reference materials (Robert F. M. Herber, University of Amsterdam, The Netherlands);
- Preconcentration by coprecipitation of lead and selenium with Ni/pyrrolidine dithiocarbamate complex and their simultaneous determination by internal standard atomic absorption spectrometry with the solid sampling technique (Ikuo Atsuya, Kohji Itoh, Kohichi Ariu, Kitamic Institute of Technology, Japan).

The September issue of *PAC* also includes five recent reports (IUPAC Recommendations on Nomenclature and Symbols and Symbols and Technical Reports from Commissions) — *see* 'Recent Reports' below.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Manual on catalyst characterization (Recommendations 1991)

This *Manual on Catalyst Characterization* has been prepared as a result of the general feeling among surface and catalyst chemists from industry and academia that the rapid development of the understanding of the mechanism of catalytic processes and the spectacular expansion of highly sophisticated catalytic technolgies has not been accompanied by the provision of the appropriate scientific language. Many terms which are widely used in the literature do not have precise scientific definitions.

Characterization of a catalytic system requires the description of the method of its preparation, specification of its physical properties, and detailed information on its structural and chemical characteristics.

A description of the catalytic properties must contain information on the rate of chemical change, on the product composition, and on the changes in the catalyst with time on stream due to poisoning, inhibition, fouling, sintering, or chemical reactions. The aim of this manual is to provide recommended definitions for the terms frequently encountered in catalytic research.

This report was prepared for publication by J. Haber, Commission on Colloid and Surface Chemistry including Catalyst, Physical Chemistry Division, and published in PAC, *Vol. 63, No. 9, pp. 1227–1246, 1991.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 12, No. 2, p. 68, 1990. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of October 1990 were taken into consideration when preparing the final report.*

Chemical sensors — definitions and classification

This report defines 'chemical sensor' and the following related terms: physical sensor; analyser; receptor; transducer; and biosensor.

Chemical sensors may be classified according to the operating principle of the transducer as follows: optical; electrochemical; electrical; mass sensitive; magnetic; thermometric; other physical properties.

This report was prepared for publication by Adam Hulanicki, Stanisław Glab and Folke Ingman, Commission on General Aspects of Analytical Chemistry, Analytical Chemistry Division and published in PAC, *Vol. 63, No. 9, pp. 1247–1250, 1991.*

Conductometric analysis of polyelectrolytes in solution

Theoretical developments concerning ion association phenomena and their implications for conductivities of polyelectrolyte solutions are surveyed in this report. Attention is focused on the characteristics of polyion/counterion association and conductivities of polyionic species. The existing literature on experimental studies of model systems is critically reviewed. The central issue is the analysis of counterion distribution, which may be quite typical in a certain range of polyionic charge densitites. Simultaneously occurring intrinsic binding between polyion and counterion is taken into consideration.

The rather extensive literature on conductometric protolytic titration of polyacids and polybases is reconsidered. Many conductometric titration curves for natural polyelectrolytes such as humic acids have originally been interpreted in terms of different types of functional groups. This report shows that such interpretation is at least premature since the data are equally well explained by counterion association, as imposed by the polyionic charge densities involved. By utilizing the effects of counterion association (especially those of higher-valency ions), conductometry can be fruitfully applied in the quantitative analysis of charged groups on polyelectrolytes.

This report was prepared for publication by Herman P. Van Leeuwen, Rob F. M. J. Cleven and Pavel Valenta, Commission on Electroanalytical Chemistry and Commission on Equilibrium Data, Analytical Chemistry Division and published in PAC, *Vol. 63, No. 9, pp. 1251–1268, 1991.*

Isotopic and nuclear analytical techniques in biological systems — a critical survey

The survey has been initiated by the Commission on Radiochemistry and Nuclear Techniques (V.7) in cooperation with the Clinical Chemistry Division (VII). The Commission identified the techniques of interest, requested corresponding critical papers from experts in each field, reviewed the papers, and ultimately compiled them into a series of articles presented below.

The first part of this survey includes articles on the following nuclear techniques which are currently available for qualitative and/or quantitative analysis of biological systems: autoradiography (macro-, micro-, and electron microscopic scale), postlabeling, radioimmunoassay and analogous binding assays, positron emission tomography (PET), particle-induced X-ray emission (PIXE), the perturbed angular correlation method (PAC), and Mössbauer spectrometry.

Evaluation of the biological applications of isotope dilution, activation analysis, and other isotopic and nuclear analytical techniques will be published in the near future. The 'biological systems' considered include humans, animals, plants, and microbes, as well as cell-free *in vitro* models.

The main aim of this survey is to provide biologists, clinical chemists, and environmental chemists, as well as analytical chemists, radiochemists, and others, with basic information, appraisal, and advice concerning the applicability, advantages, disadvantages, and development perspectives of the individual techniques. If necessary, this survey can be easily extended onto other newly developing isotopic and nuclear analytical techniques. Therefore, any comments and suggestions on this matter conveyed directly to the Editor (Kazimierz S. Kasprak, National Cancer Institute, Frederick Cancer Research and Development Center, Bldg. 538, Room 205E, Frederick, MD 21702—1210, USA) will be greatly appreciated.

This report was prepared for publication by Kazimierz S. Kasprzak, Commission on Radiochemistry and Nuclear Techniques, Analytical Chemistry Division, and published in PAC, *Vol. 63, No. 9, pp. 1269–1306, 1991.*

Nomenclature of derived quantities (Recommendations 1991)

Historically, two approaches have been used to name quantities: firstly use of words to denote the property or process (trivial name) and secondly to denote the mathematical definition of the quantity (systematic name). Current usage provides words that can be used for the systematic naming of quantities defined from two quantities of the same kind (e.g. $x = y_1/y_2$), but is inadequate for quantities defined by division of one quantity by another of a different kind (i.e. $x = y/z$). The recommendation introduces rules for naming derived kinds of quantities. It is envisaged that the nomenclature of quantities must be dualistic, to exploit the advantages and deficiencies of each approach.

This report was prepared for publication by J. C. Rigg, B. F. Visser and H. P. Lehmann, Commission on Quantities and Units in Clinical Chemistry, Clinical Chemistry Division and Committee on Quantities and Units, Scientific Division, International Federation of Clinical Chemistry, and published in PAC, *Vol. 63, No. 9, pp. 1307–1311, 1991.*

Practical importance of enzyme stability

There are three parts to this report:

1. *Natural sources of more stable enzymes*

The most frequently used sources of more stable enzymes are aerobic thermophilic microorganisms.

They rapidly and effectively produce enzymes having a higher thermal stability than those derived from mesophilic micro-organisms. They have also a higher resistance to most chemical denaturants. This is of importance for enzyme applications especially in biocatalytic reactions.

2. *Increase of enzyme stability by immobilization and treatment with low-molecular-weight reagents*

Increase of enzyme stability is possible by multi point interaction with a support and treatment with low-molecular-weight reagents. There seems to be a correlation between the degree of stabilizing and the number of covalent bonds between the enzyme and the polymeric support until a critical number of bonds is attained. On the other hand, low-molecular-weight reagents cause stabilizing covalent modifications of enzymes. For instance, hydrophilization of surface residues of enzymes results in a stability increase.

3. *Increase of enzyme stability by protein engineering*

Protein engineering can be used to prevent destabilizing processes that normally result in enzyme inactivation. The structural integrity of a protein can be strengthened via mutagenesis guided either by rational design or by selection pressure. This section reviews recent applications of both methods for the stabilization of enzymes.

This three-part technical report was prepared for publication by B. Zentgraf and T. J. Ahern, Steering Committee on Biophysical Chemistry, Physical Chemistry Division, and published in PAC, *Vol. 63, No. 10, pp. 1527–1540, 1991.*

Recommendations for nomenclature and symbolism for mass spectroscopy — including an appendix of terms used in vacuum technology (Recommendations 1991)

The recommendations contained in this document refer to nomenclature relating to theoretical, technological and experimental aspects of mass spectroscopy, and to the symbolism used when presenting and discussing mass spectral data.

In 1974, the Commission on Analytical Nomenclature of IUPAC issued recommendations for nomenclature of mass spectroscopy which are in the form of definitions of some of the terms used in this subject. In 1978 the Commission on Molecular Structure and Spectroscopy updated and extended these recommendations and, in addition, made further recommendations concerning the use of symbols, acronyms, abbreviations and newly invented jargon.

Because the subject continues to expand rapidly, a further compilation of defined terms has become necessary, and the opportunity has been taken to incorporate previous relevant recommendations concerning nomenclature and symbolism in order to produce a single comprehensive document. A further set of terms relating to vacuum technology, provided through the generosity of the American Vacuum Society, has been appended. It is therefore intended that this set of recommendations should replace the earlier publications on the subject.

This report was prepared for publication by John F. J. Todd, Commission on Molecular Structure and Spectroscopy in conjunction with the Subcommittee on Mass Spectroscopy, Physical Chemistry Division, and published in PAC, *Vol. 63, No. 10, pp. 1541–1566, 1991.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 9, No. 5, p. 181, 1987. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of February 1988 were taken into consideration when preparing the final report.*

Intrinsic characterization of continuous fibre reinforced thermoplastic composites. 1. Toughness characterization of carbon-fibre–polyether-ether-ketone (CF–PEEK) laminates

After reviewing some of the early studies of toughness measurement of continuous carbon-fibre-reinforced polyether ether ketone (PEEK), this work reports on some experimental studies of toughness measurements conducted by eight independent laboratories. The measurements were of two types; either plate-type specimens of angle ply specimens studied by instrumented falling weight impact or by the adoption of linear elastic fracture mechanics on unidirectional laminates.

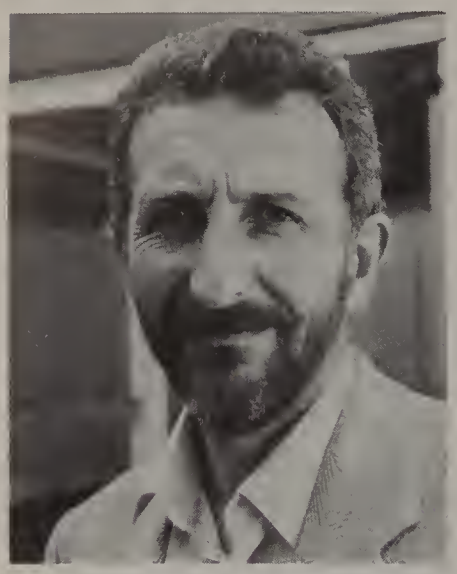
The comparative measurements are supplemented by additional observations that enable an objective interpretation to emerge from the data from the eight laboratories. The fracture mechanics parameters for assessing toughness provides a reasonable agreement on the measurement of toughness and indicates that the isotropic geometry functions that are necessary in the analysis of the data work well for unidirectional laminates.

The agreement is far from good for the instrumented falling weight impact data and some explanation for this is discussed.

This report was prepared for publication by D. R. Moore and J. C. Seferis, Working Party on Structure and Properties of Commercial Polymers, Commission on Polymer Characterization and Properties, Macromolecular Division, and published in PAC, *Vol. 63, No. 11, pp. 1609–1625, 1991.*

Behaviour of pesticides in water catchments

A Workshop on the Behaviour of Pesticides in Water Catchments was held in Hamburg after the IUPAC General Assembly. Tony Dobbs (Chairman of the Commission on Water Chemistry) reports.



Tony Dobbs.

Following the IUPAC General Assembly in Hamburg (August 1991) the Water Chemistry Commission organized a 2-day Workshop on the Behaviour of Pesticides in Water Catchments which concentrated on modelling and land-use practices and their influence on pesticides residues in water. The meeting involved collaboration with the Agrochemicals Commission and was designed to be a Workshop with limited numbers of participants in order to encourage active discussion of the papers presented.

The Workshop was introduced by Tony Dobbs (WRc Medmenham, UK), the Chairman of the Water Chemistry Commission, who gave some background to the problem of pesticide contamination in water by reference to the position in the UK, which was recently summarized by the Drinking Water Inspectorate's report of its Chief Inspector. This indicated that there are approximately 450 individual pesticides used in the UK and during the past 2 years roughly half a million samples of water were taken and analysed for pesticide residues. From these samples 43 individual pesticides were detected in water at levels greater than the 0.1 μg/l set by the water regulations in the UK, which is the same level as specified in the EC (European Community) Drinking Water Directive, and therefore is applicable throughout Europe.

Terry Roberts (Hazleton UK, UK) gave the next paper on procedures for assessing the environmental fate of pesticides. Terry took the participants through the various stages involved in pesticide regulatory studies, concentrating on those that influenced the behaviour and fate of pesticides in soils and water. Terry emphasized that despite the commonality of objective in the requirements of the regulations in different countries, there are still a number of detailed differences in the testing procedures required. Terry emphasized that differences in experimental guidelines is causing unnecessary replication of studies which add little to our scientific understanding of pesticide fate in the environment.

The next paper was by Don Wauchope (US Department of Agriculture, USA), entitled 'Pesticide leaching and run off models'. Don summarized the factors that can influence the behaviour and fate of pesticide residues in the soil system and emphasized that the complexities of the interacting processes which control the run off and leaching of pesticides into water.

Nicky Ayscough (WRc Medmenham, UK) gave a paper on 'Surface water models for transport and fate of pesticides in rivers and streams'. It summarized the processes that can influence pesticide concentrations once the residues get into the water bodies. In general the processes are fairly well understood and with a moderate degree of effort in collecting the relevant environmental properties for the models, behaviour can be fairly accurately predicted. However, it was stressed that an understanding of the environmental processes is an essential prerequisite for getting reliable information from the mathematical models.

Zev Gerstl from the Institute of Soils and Waters in Bet Dagan in Israel presented a paper on the 'Validation and reliability of pesticide fate models.' He emphasized in his introduction the necessity for a consistent use of relevant terms in modelling. This was generally acknowledged to be a good point as the terms validation, calibration and verification are being used quite loosely by different authors in this area. Zev pointed out that the output of models has to be critically analysed and interpreted in such a way that the regulator or decision maker can determine the meaning of the results, as well as their accuracy and reliability. In order to do this the various assumptions inherent in the model and their associated limitations must be clear to the decision maker and he concluded that our ability of inability to accurately determine field concentrations due to intrinsic and extrinsic variability might well be a factor which limits our efforts to validate model predictions.

On Tuesday morning Micheal Säle (IVA, Germany) gave a talk on the effect of farming practices on pesticide residues. His talk drew attention to the fact

that the reduction of pesticides in surface waters cannot only be achieved by changes in the chemical properties of the pesticides, but is also strongly influenced by agricultural practices such as timing and manner of application. Precise recommendations have to be geared to specific local conditions and it is important that the results of research in this area are rapidly and effectively disseminated to those involved in the application of pesticides.

There then followed a series of presentations which summarized the experiences and plans for pesticide control in different countries. Don Wauchope gave a summary of experiences in the USA, followed by Brian Waters (NRA Severn Trent Region, UK) who summarized the position in the UK. Brian raised the very real problem of chemical analysis with such a wide variety of pesticides of concern and very low limits of detection implied by the 0.1-μg/l limit, a great deal of work is required both in the quality control necessary to perform reliable measures of these low levels. He also felt there were many opportunities for co-operation in the development of suitable analytical techniques.

Yehuda Shevah (Ministry of Science and Technology, Israel) summarized trends in management of pesticides and environmental effects in Israel, and Willie Peijnenburg (RIVM, The Netherlands) presented a paper on the current position in The Netherlands. Dr Battaglia (Directtore Generale AMAC) from Bergamo in Italy summarized the position in Italy where atrazine has been effectively banned because of residues in water, but now problems are starting to arise as a result of the replacement pesticides that are being used.

Arne Helweg from the Research Centre for Plant Protection in Denmark, summarized the position in his country and noted that it is not only conventional agricultural practices that give rise to significant pesticide residues as witnessed by high levels of atrazine and hexazinone of up to 40-μg/l in groundwater beneath Christmas-tree plantations.

Albericht Klein (Umweltbundesamt, Germany) outlined the actions being undertaken under the new German plant protection act for the control of pesticides in water, and Keith Solomon (Canadian Centre for Toxicology, Canada) summarized the position on pesticide regulation and water pollution control in Canada. Keith reported the rather unusual protection zones requirements which the government have instituted as a result of pesticide application to forestry from DC8 aircraft flying at 1000 m.

Approximately 25 people attended the meeting and the discussion after all of the papers was a lively one and there was a good interchange of views and experiences. The Workshop also elicited some local interest and one of the German delegates was despatched to speak to the local press. The proceedings of this Workshop which was sponsored by both IUPAC and ICSU will be published as a monograph early in 1992.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions will be published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports.

If you would like to comment on these provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of national/regional centres appeared in *CI*, Vol. 14, No. 1, p. 25, 1992.

Recommendations for nomenclature in laboratory robotics and automation

These recommended terms have been prepared to help provide a uniform approach to terminology and notation in robotic laboratory automation. Because it has been derived from diverse backgrounds, the terminology used in laboratory robotics is often vague, imprecise, and in some cases, in conflict with classical robotic nomenclature. These definitions have been assembled from monographs, dictionaries, journal articles, and documents of organizations emphasizing laboratory and industrial robotics. When appropriate, definitions have been taken directly from the original source. However, in some cases no acceptable definition could be found and a new definition was prepared. Attention has been given to defining specific robot types, coordinate systems, parameters, attributes and associated workstations and hardware. Diagrams have been included to illustrate specific concepts that can best be understood by visualization.

It is hoped that these assembled definitions will be useful for the practitioners of laboratory robotic automation.

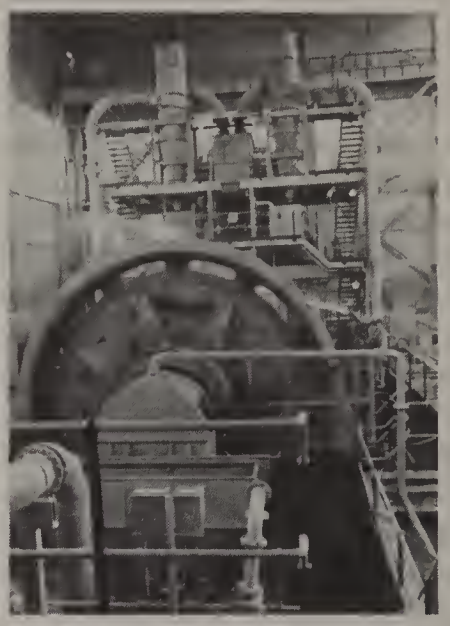
Comments on the document are welcome and should be sent by 31 October 1992 to: Dr Colin Graham, Haworth Building, Department of Chemistry, University of Birmingham, PO Box 363, Birmingham B15 2TT, UK.

International Newsletter on Chemical Education

The opening article in June 1991 issue of *International Newsletter on Chemical Education* (No. 35), by Jophus Anamuah-Mensah (University of Cape Coast, Ghana), considers the contribution games can make to the teaching of school chemistry in Ghana. This is followed by an account by Michael Quigley (University of Pittsburgh, USA) on 'Role-playing for undergraduate analysts'. Jacqueline Barber (University of California, Berkeley, USA) describes how simulations of crime laboratory investigations can be used to teach science.

In their account of the Wits-Phoenix Project, based at the University of Witwatersrand and supported by South Africa's Chamber of Mines, John Bradley and Marie Brand describe the development of curriculum resources for teachers. Specific attention was given, in the first phase of this project, to the mining and mineral processing industry which plays such a crucial role in the South African economy. For example, mining contributes some 14% to the GDP and accounts for one in every eight people in active employment.

Norma Chadwick (Thames Polytechnic, London, UK) asks 'Chemical education for women: why do we waste this resource?) She presents a number of pertinent statistics to highlight the difficulties faced by women attempting to maintain both career and family and poses a number of even more pertinent questions to see how we might 'encourage these women who have had the enthusiasm to learn and succeed in chemistry at school and university to take up employment in chemistry'.



Grinding mill at the Luipaards vlei Gold Mine in South Africa: the first phase of the Wits-Phoenix Project focused on mining and mineral processing in South Africa.

INCE was launched in 1974, with financial support from UNESCO, and the intention to promote exchange of ideas and disseminate information throughout the international chemistry teaching community. The first editor was Prof. C. N. Ram Rao, at that time Chairman of IUPAC's Committee on Teaching of Chemistry. He was superseded as editor in 1978 by Prof. David J. Waddington, then Secretary of IUPAC–CTC. Since 1986 INCE has been edited by Mr Peter J. Towse (pictured above during a recent visit to the IUPAC Secretariat). Despite continuing problems of financial support, the newsletter has managed to appear twice each year and its news and articles have been greatly appreciated all over the world, especially in Third World countries.

The International Newsletter on Chemical Education *is published by the IUPAC Committee on the Teaching of Chemistry in cooperation with UNESCO. The Editor is Peter Towse, University of Leeds, Leeds LS2 9JT, UK.*

Solubility of Gases in Liquids

Dr Peter Fogg, a Titular Member of the Commission on Solubility Data worked with the late Dr William Gerrard to produce a monograph entitled *Solubility of Gases in Liquids*. This book is based on their work for the Commission over many years. Although this book has been produced outside the Commission it will serve as a useful complement to volumes on gas solubility in the *Solubility Data Series*, published by Pergamon Press for IUPAC. Readers of the monograph are directed to this series for further information whenever this is appropriate.

In the first four chapters methods of measurement and theories of gas solubility are reviewed. Criteria for evaluation of published data are discussed. The solubilities in water and non-aqueous solvents of 27 of the more important gases are comprehensively reviewed in chapters 5–13. Data from different sources are compared, evaluated and expressed in tabular form. Fitting equations are given where necessary. The

numerous graphs showing solubility data enable easy comparison between the behaviour of different gas–liquid systems. Each chapter concludes with a list of references to the original work. In the final chapter guidelines are presented for the estimation of solubilities of gases for which no data are available.

Dr Gerrard died shortly before his 90th birthday. He was able to discuss the completed manuscript but he did not live to see its publication. This book serves as a memorial to his interest in the solubility of gases and his enthusiastic support for the work of the Commission on Solubility Data.

Solubility of Gases in Liquids *by P. G. T. Fogg and W. Gerrard, is published by Wiley, Chichester, UK, 1991. pp. xii +332; ISBN 0 471 92925 5; Price (hardback) GBP 75.00.*

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

April 1991 issue of *ISO Bulletin*:

TC 42	**Photography**
ISO 9718:1991	Photography – Processed vesicular photographic film – Specifications for stability
TC 45	**Rubber and rubber products**
ISO 6802:1991	Rubber and plastics hose and hose assemblies with wire reinforcements – Hydraulic impulse test with flexing
ISO 7326:1991	Rubber and plastics hoses – Assessment of ozone resistance under static conditions
TC 61	**Plastics**
ISO 9988–1:1991	Plastics – Polyoxymethylene (POM) moulding and extrusion materials – Part 1: Designation
TC 77	**Products in fibre-reinforced cement**
ISO/TR 1896:1991	Products in fibre-reinforced cement – Non-combustible fibre-reinforced-boards of calcium silicate or cement for insulation and fire protection
TC 79	**Light metals and their alloys**
ISO 9916:1991	Aluminium alloy and magnesium alloy castings – Liquid penetrant inspection
TC 87	**Cork**
ISO 9727:1991	Cylindrical stoppers of natural cork – Physical tests – Reference methods
TC 145	**Graphical Symbols**
ISO/TR 1048:1991	Graphical symbols incorporating arrows – Synopsis
TC 171	**Micrographics and optical memories for document and image recording, storage and use**
ISO 446:1991	Micrographics – ISO character and ISO test chart No. 1 — Description and use
TC 175	**Fluorspar**
ISO 9501:1991	Metallurgical-grade fluorspar – Determination of total sulfur content – Iodometric method after combustion
TC 183	**Copper, lead and zinc ores and concentrates**
ISO 9599:1991	Copper, lead and zinc sulphide concentrates – Determination of hygroscopic moisture in the analysis sample – Gravimetric method
TC 184	**Industrial automation systems and integration**
ISO 9946:1991	Manipulating industrial robots – Presentation of characteristics

May 1991 issue of *ISO Bulletin*:

TC 5	**Ferrous metal pipes and metallic fittings**
ISO 559:1991	Steel tubes for water and sewage
TC 34	**Agricultural food products**
ISO 3100–1:1991	Meat and meat products – Sampling and preparation of test samples – Part 1: Sampling
ISO 4831:1991	Microbiology – General guidance for the enumeration of coliforms – Most probable number technique
ISO 4832:1991	Microbiology – General guidance for the enumeration of coliforms – Colony count technique
ISO 4833:1991	Microbiology – General guidance for the enumeration of micro-organisms – Colony count technique at 30°C
ISO 6654:1991	Animal feeding stuffs – Determination of urea content
TC 45	**Rubber and rubber products**
ISO 4648:1991	Rubber, vulcanized of thermoplastic – Determination of dimensions of test pieces and products for test purposes
TC 155	**Nickel and nickel alloys**
ISO 7156:1991	Refined nickel – Sampling

June 1991 issue of *ISO Bulletin*:

TC 17	**Steel**
ISO 4995:1991	Hot-rolled steel sheet of structural quality
ISO 4996:1991	Hot-rolled steel sheet of high yield stress structural quality
ISO 4997:1991	Cold-reduced steel sheet of structural quality
ISO 4998:1991	Continuous hot-dip zinc-coated carbon steel sheet of structural quality
ISO 4999:1991	Continuous hot-dip terne (lead alloy) coated cold-reduced carbon steel sheet of commercial and drawing qualities
ISO 5950:1991	Continuous electrolytic tin-coated cold-reduced carbon steel sheet of commercial and drawing qualities
ISO 10138:1991	Steel and iron – Determination of chromium content – Flame atomic absorption spectrometric method
TC 28	**Petroleum products and lubricants**
ISO 3012:1991	Gasoline, kerosine and distillate fuels – Determination of mercaptan sulfur – Potentiometric method
TC 30	**Measurement of fluid flow in closed conduits**
ISO 9104:1991	Measurement of fluid flow in closed conduits – Methods of evaluating the performance of electromagnetic flow-meters for liquids
TC 34	**Agricultural food products**
ISO 605:1991	Pulses – Determination of impurities, size, foreign odours, insects, and species and variety – Test methods
TC 44	**Welding and allied processes**
ISO 5182:1991	Welding – Materials for resistance welding electrodes and ancillary equipment
TC 45	**Rubber and rubber products**
ISO 6894:1991	Rubber compounding ingredients – Carbon black – Preparation of samples for determination of dibutylphthalate absorption number (compressed sample)
TC 61	**Plastics**
ISO 1133:1991	Plastics – Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics
ISO 1628-3:1991	Plastics – Determination of viscosity number and limiting viscosity number – Part 3: Polyethylenes and polypropylenes

Certification system for measuring instruments

The International Organization of Legal Metrology (OIML) has launched a certification system for measuring instruments.

Metrology, the science of measurement, has an important place in world trade; the *OIML Certificate System for Measuring Instruments* aims to facilitate, accelerate and harmonize the work of national or regional bodies that approve types or patterns of measuring instruments.

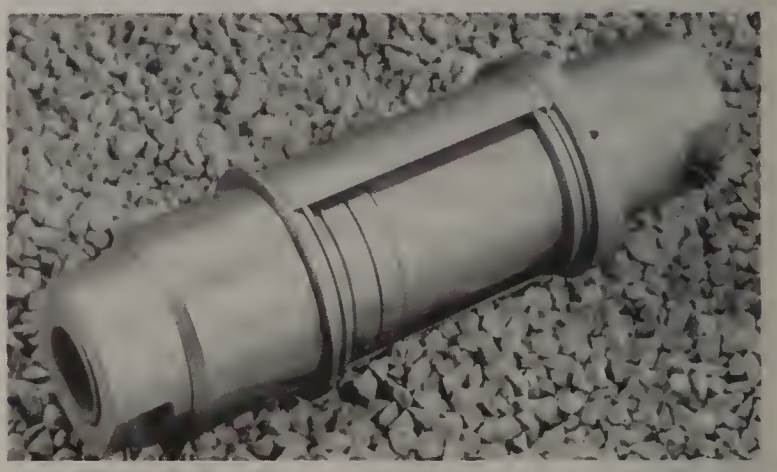
The certification system should benefit instrument manufacturers to sell their products in OIML member countries that have legal controls, as well as for applications not under such controls.

The system certifies the conformity of a pattern of a measuring instrument with the requirements of relevant OIML Recommendations.

Work on the *OIML Certificate System for Measuring Instruments* started in 1987 on the initiative of the International Committee of Legal Metrology and culminated in 1990 with the decision to launch the system. It applies to all categories of measuring instruments for which there are relevant OIML Recommendations.

The document *OIML Certificate System for Measuring Instruments* can be obtained from the International Bureau of Legal Metrology, 11, Rue Turgot, 75009 Paris, France. It is free of charge for the administrative services of Member States and for International Organizations in liaison with OIML, and FRF 60,00 (plus postage) for private enterprises.

(From: *ISO Bulletin* April 1991, page 5)



A high-temperature flowmeter: the OIML system certifies the conformity of a pattern of a measuring instrument with the requirements of relevant OIML recommendations.

Conferences

Biological and environmental reference materials

Aachen, Germany
11–14 May 1992

IUPAC SPONSORED

The 5th International Symposium on Biological and Environmental Reference Materials will be held on 11–14 May 1992 in Aachen, Germany.

The major aim of this symposium series is to bring together efforts in the production, study and use of reference materials in the analytical, biological, biomedical, clinical, environmental, and nutritional communities.

The 5th symposium will continue the series of symposia held on this topic approximately every 2 years. The exchanges of ideas and information documented in the proceedings of the 4th symposium, held in February 1990 at Orlando, Florida, USA, covered a wide variety and scope of information in the area of reference materials. Activities at the 5th symposium are expected to both broaden these discussions and to focus on more specific aspects of further research on problems and progress of projects discussed at the previous symposium.

Participation in the symposium is open to all who are interested in reference materials and standards in the biological and environmental areas. The registration fee of DM 450 will cover attendance at the symposium, the book of abstracts, the published proceedings and other activities.

The symposium will be held in the Novotel, Aachen, Germany. A block of rooms has been set aside for attendees at a special conference rate. Details regarding hotel reservations will be sent with the registration materials upon request.

Heteroatom chemistry

Riccione, Italy
7–12 June 1992

IUPAC SPONSORED

The 3rd International Conference on Heteroatom Chemistry (ICHAC–3) will take place at the Plazzo del Turismo, in Riccione, Italy on 7–12 June 1992. Riccione is a beach resort on the Adriatic Coast, some 120 km south-east of Bologna.

The aim of this international conference is to bring together researchers interested in the role of heteroatoms such as sulfur, silicon, phosphorus, boron, tin, selenium, bismuth, halogens and so on, for such varied purposes as organic reactions and synthesis, mechanistic, structural, and theoretical studies in order to promote a broader interdisciplinary exchange of knowledge than is possible in more specialized meetings.

The official language of the conference will be English.

In addition to approximately 25 plenary and invited lectures, given by leading scientists, a limited number of contributions will be presented orally. Emphasis, however, will be placed on poster sessions with ample time and space for their presentation and discussion.

The main conference themes are:

- heteroatom mediated (organic) synthesis;
- synthesis of heteroatom-containing structures;
- structural, mechanistic, and theoretical aspects;
- biological aspects of heteroatom chemistry;
- hetero-organic molecular materials.

Plenary lecturers, according to the first announcement, will include: D. H. R. Barton (College Station); P. Beak (Urbana); H. J. Bestmann (Erlangen); E. Block (Albany); A. Eschenmoser (Zürich); F. Mathey (Palaiseau); F. Ogura (Hiroshima); H. Schmidbaur (Munich); N. Sonoda (Osaka); M. Tiecco (Perugia); E. Vedejis (Madison); F. Wudl (Santa Barbara).

14th International Conference on Liquid Crystals will be held in Pisa, Italy.

Liquid crystals

Pisa, Italy
21–26 June 1992

IUPAC SPONSORED

The 14th International Liquid Crystal Conference (14th ILCC) will be held at the Congress Hall of the University of Pisa, Italy on 21–26 June 1992.

The conference will provide a forum for the presentation and discussion of the most recent advances in liquid-crystal science and technology. Experts will be brought together from around the world to discuss the state-of-the-art as well as future prospects in the field of liquid crystals.

The conference programme will be divided into various broad sections covering theoretical, experimental (chemistry and physics), and applications of liquid crystals and polymer liquid crystals. It will include plenary lectures, invited section lectures, and contributed (oral and poster) papers. Speakers from both industry and academia will be represented. In addition, a manufacturer's exhibition will be arranged in which a variety of liquid-crystal devices and products will be displayed.

The following sections are planned:
Liquid crystals

- Synthesis and molecular properties;
- Chiral phases;
- Ferroelectrics and antiferroelectrics;
- Nonlinear optics;
- Surfaces and interfaces;
- Phase structure and phase transitions;
- Instability, defects and fluctuations;
- Molecular theory and microscopic properties;
- Lyotropics, LB films and bilological systems;
- Applications.

Polymer liquid crystals

- Synthesis and molecular properties;
- Industrial production, processing and applications;

The proceedings of the conference will be published as a special volume of *Liquid Crystals* and a complimentary copy will be made available to all registered participants. IUPAC affiliate members will be offered a discount on the registration fee and there will be a reduced registration fee for students. The deadline for pre-registration is 30 April 1992.

The official language of the conference will be English. No translation facilities will be available.

Accommodation will be in hotels of different price categories, in town or in the nearby surroundings, that have been reserved for conference delegates. However, June is just at the beginning of the peak season for tourism in Pisa, and an early booking is strongly recommended. A number of social events and a programme for accompanying people are planned in conjunction with the conference and post-conference tours will be available.

Pisa is a town known world-wide for its unique leaning tower and the other monuments in the Miracles Square and in addition is set in one of the most beautiful regions of the Italian peninsula. Pisa International Airport provides daily connections with London, Frankfurt and Paris, as well as with the intercontinental airports in Rome and Milan. Train connections are available with many Italian towns including Florence, Rome, Genoa and Turin.

The conference will be held at the beginning of the Italian summer and dry warm conditions can be expected with typical temperatures of 18–30°C.

The second circular with general information, registration and accommodation forms, provisional scientific programme and forms for submission of contributions to the conference is available.

Surface chemistry, adsorption and chromatography
Moscow, Russia
29 June–3 July 1992

IUPAC SPONSORED

The 2nd International Symposium on Surface Chemistry, Adsorption and Chromatography (SCAC 92) will be held in Moscow. The first such symposium, dedicated to the memory of Prof. A. V. Kiselev, was also held in Moscow in November 1988.

The scientific programme of SCAC 92 will consist of invited lectures, contributed papers and poster sessions. It will include the following topics:

- Surface chemistry – research methods, and relevance to selectivity in separation processes.
- Adsorptive properties of materials – chromatographic research methods of the structure of adsorbents, relation between the structure of adsorbents and their kinetic properties, and the effectiveness of separation systems.
- Chromatographic methods of characterizing disperse materials, adsorbents, surface layers and catalysts.
- Other questions of common interest for specialists engaged in the fields of adsorption and chromatography.

Chromatographic methods of characterizing disperse materials, adsorbents, surface layers and catalysts is one of the topics of SCAC 92.

Université de Québec à Montréal, venue of ICOS 92.

The following specialists have been invited to present lectures at the symposium: F. Bruner (Italy), H. Engelhardt (FRG), W. Engewald (FRG), G. Guiochon (USA), J. K. F. Huber (Austria), J. Janak (CSFR), N. A. Katsanos (Greece), S. Kondo (Japan), E. Kovats (Switzerland), J. D. F. Ramsay (UK), R. Rodriguez-Reinoso (Spain), J. Rouquerol (France), A. I. Rusanov (USSR), K. S. W. Sing (UK), W. A. Steele (USA), K. Unger (FRG).

The symposium languages will be English and Russian. Simultaneous translation will be provided.

The registration fee is reduced by 10% for IUPAC affiliates. Accommodation for delegates will be available in a hotel near the congress centre.

The symposium will be held in the middle of the summer and hot dry conditions can be expected with typical temperatures of 20–25°C.

Organic synthesis
Montréal, Canada
28 June–2 July 1992

IUPAC SPONSORED

The 9th International Conference on Organic Synthesis (ICOS 92) will be held at the Université du Québec à Montréal, Montréal, PQ, Canada.

The conference will be a forum for scientists to discuss the latest achievements in this area of chemistry. It will consist of ten plenary lectures, ten invited lectures, poster sessions and contributed papers chosen among the contributed works submitted for the poster sessions.

The themes of the plenary lectures are:

Strategies and reagents for stereocontrol in synthesis:

- New strategies for the construction of polycyclic compounds (P. Deslonchamps, Canada);
- New asymmetric synthesis (L. Ghosez, Belgium);
- Organobismetallic reagents in organic synthesis (J. F. Normand, France);
- Development of radical reactions in natural product synthesis (G. Pattenden, UK);
- Total synthesis of calcitriol (G. Stork, USA).

Advances in asymmetric synthesis:

- Studies in asymmetric synthesis (D. Evans, USA);
- Asymmetric synthesis catalysed by chiral transition complexes (T. Hayashi, Japan);
- Lecture title to be announced (D. Seebach, Switzerland);
- Recent advances in asymmetric synthesis (K. B. Sharpless, USA).

Biomolecules in organic synthesis:

- New opportunities at the interface of chemistry and biology (P. G. Schultz, USA).

Lectures will be presented in English or French although no simultaneous translation will be offered.

The pre-registration fees (after 1 March 1992) are CAD 400.00 for scientific participants, CAD 200.00 for students and CAD 75.00 for accompanying persons. The fees include admission to the scientific sessions, receipt of printed materials (for participants and student registrants), attendance at the Welcome Reception on Sunday and a complimentary metro and bus pass for the duration of the conference.

Blocks of rooms have been reserved in different classes of hotels close to the conference site. Early reservations are recommended because many events will be taking place at that time to celebrate the 350th anniversary of the founding of the city. Montréal is a modern, cosmopolitan city with a French flair. It is home to four important universities: the Université de Montréal, McGill University, Concordia University and the Université du Québec à Montréal (which will serve as host and venue for the conference).

Montréal is served by two major airports: Dorval for North American flights and Mirabel for transatlantic ones. Transport is available from each of these to the centre of town.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1992

Centenary of Geneva conference

22–24 April. Centenary of Geneva Conference – Organic Chemistry: Its Language and Its State of the Art. Geneva, Switzerland.
(Dr M. V. Kisakürek, Editor, Helvetica Chimica Acta, Redaktion, Postfach 313, CH-4010 Basel, Switzerland.)

Biological and environmental reference materials

11–14 May. 5th International Symposium on Biological and Environmental Reference Materials (BERM-5). Aachen, Germany.
(Dr W. R. Wolf, Nutrient Composition Laboratory, United States Department of Agriculture, Beltsville, MD 20705, USA.)

Calorimetry and thermodynamics of biological processes

15–19 May. International Symposium on Calorimetry and Thermodynamics of Biological Processes. Fiskebäckskil, Sweden.
(8th ISBC, Department of General & Marine Microbiology, Carl Skottsbergs Gata 22, S-41319 Göteborg, Sweden.)

Heteroatom chemistry

7–12 June. 3rd International Conference on Heteroatom Chemistry. Riccione, Italy.
(Prof. A. Fava, C.N.R. – I.co.C.E.A., Via della Chimica, 8, I-40064 Ozzano Emilia-BO, Italy.)

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably 2 YEARS and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *CI*, Vol. 11, No. 1, pp. 4–5, 1989.

Liquid Crystals

21–26 June. 14th International Liquid Crystal Conference. Pisa, Italy.
(Prof. E. Chiellini, Chairman, Department of Chemistry & Industrial Chemistry, University of Pisa, 56126 Pisa, Italy. Tel. +39 (50) 587272. Fax. +39 (50) 587260.)

Organic synthesis

28 June–2 July. International Conference on Organic Synthesis. Montréal, Québec, Canada.
(Prof. Jean-Claude Richer, Département de Chimie, Université de Montréal, C.P. 6128 succursale A, Montréal, Québec H3C 3J7, Canada.)

Surface chemistry, adsorption and chromatography

29 June–3 July. 2nd International Symposium on Surface Chemistry, Adsorption and Chromatography. Moscow, Russia.
(Prof. O. Larionov, Institute of Physical Chemistry, Russian Academy of Sciences, Leninski Prospekt 31, Moscow 117915, Russia.)

Carbohydrates

5–10 July. 16th International Carbohydrates Symposium. Paris, France.
(Prof. P. Sinay, École Normale Superieure, Laboratorie de Chimie, 24 Rue Lhomond, 75231 Paris Cédex 05, France.)

Ring opening polymerization

7–11 July. International Symposium on Ring Opening Polymerization. Warsaw, Poland.
(R.O.P. Organizing Committee, Institute of Polymer Chemistry, Polish Academy of Sciences, ul. M. Curie-Skłodowskiej 34, 41–800 Zabrze, Poland.)

Solubility phenomena

8–10 July. 5th International Symposium on Solubility Phenomena. Moscow, Russia.
(Prof. V. M. Valyashko, N. S. Kurnakov Institute of General and Inorganic Chemistry, Leninsky Prospekt 31, Moscow, GSP-1, 117907, Russia.)

Computers in chemical research and education

12–17 July. 10th International Conference on Computers in Chemical Research and Education. Jerusalem, Israel.
(Professor Y. Wolman, Department of Organic Chemistry, The Hebrew University, Jerusalem 91904, Israel.)

Risk management of chemicals

13–16 July. International Symposium on Risk Management of Chemicals Can Chemicals be Used Safely? Guildford, UK.
(Dr J. F. Gibson, Secretary (Scientific), The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Macromolecules

13–18 July. 34th International Symposium on Macromolecules. Prague, Czechoslovakia.
(IUPAC Macro 92 Secretariat, Institute of Macromolecular Chemistry, Czechoslovak academy of Sciences, Heyrovského, nám. 18882/2, 162 06 Prague 6, Czechoslovakia. Tel. +42 (2) 360317. Telex 122019 IMCP C.)

Chemistry, agriculture and the environment

17–19 July. International Conference on Chemistry, Agriculture and the Environment. Guildford, Surrey, UK.
(Dr D. Stevenson, Robens Institute of Health and Safety, University of Surrey, Guildford, Surrey GU2 5DX, UK.)

Novel aromatic compounds

19–24 July. 7th International Symposium on Novel Aromatic Compounds. Victoria, B.C., Canada.
(Dr R. H. Mitchell, Department of Chemistry, University of Victoria, Box 3055, Victoria, B.C., Canada V8W 3P6.)

Photochemistry

19–25 July. 14th International Symposium on Photochemistry. Leuven, Belgium.
(Organizing Committee, IUPAC Photochemistry, K.U. Leuven, Department of Chemistry, Celestijnenlaan 200F, B-3001 Heverlee, Belgium.)

Exploration, mining and processing of materials

2–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, Republic of South Africa.
(The Symposium Secretariat, Mintek, Private Bag X3015, Randburg, 2125 South Africa. Tel. +27 (11) 7933511 Fax. +27 (11) 7932413 Telex 424867 SA.)

Macrocyclic chemistry

9–14 August. 17th International Symposium on Macrocyclic Chemistry. Provo, Utah, USA.
(Chemistry Department: ISMC, 226 ESC, Brigham Young University, Provo, Utah 84602, USA. Tel. +1 (801) 3782315. Fax. +1 (801) 3785474.)

Chemical thermodynamics

16–21 August. 12th International Conference on Chemical Thermodynamics (ICCT). Utah, USA.
(Chemistry Department: ICCT, 226 ESC, Brigham Young University, Provo, Utah 84602, USA. Tel. +1 (801) 3786269. Fax. +1 (801) 3785474. Telex 706448.)

Biotechnology

16–21 August. 9th International Biotechnology Symposium. Crystal City, Virginia, USA.
(9th International Biotechnology Symposium Headquarters, American Chemical Society, 1155 Sixteenth Street, N.W., Room 205, Washington, D.C. 20036-4899, USA. Tel. +1 (202) 8726286. Fax. +1 (202) 8726128.)

Flame structure

18–22 August. 4th International Seminar on Flame Structure. Novosibirsk, Russia.
(Prof. V. E. Zarko, Institute of Chemical Kinetics and Combustion, Novosibirsk 630090, Russia.)

Dr Vic Schüler (left) and IUPAC affiliate Ron Mallet (right) are respectively Chairman and Vice-Chairman of the Organizing Committee of the IUPAC sponsored 3rd International Symposium on Analytical Chemistry in the Exploration, Mining, and Processing of Materials to be held in South Africa in August 1992.

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than 3 months in advance. If a visa is not granted 1 month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

Natural products

30 August–4 September. 18th International Symposium on Natural Products. Strasbourg, France.
(Prof. G. Ourisson, Centre de Neurochimie, 5 rue Blaise Pascal, F-67084 Strasbourg, France. Tel. +33 88600513. Fax. +33 88607620. Telex ULP 870260F.)

Raman spectroscopy

31 August–4 September. 13th International Conference on Raman Spectroscopy. Würzburg, Germany.
(Prof. W. Keifer, Institut für Physikalische Chemie, Universität Würzburg, Marcusstrasse 9–11, W—8700 Würzburg, Germany.)

CHEMRAWN VIII

6–9 September. World Conference: Chemistry and Sustainable Development Towards a Clean Environment, Zero Waste and Highest Energy Efficiency. Moscow, Russia.
(Prof. V. A. Koptyug, USSR Academy of Sciences, 14 Leninsky Avenue, 117901 Moscow V-71, Russia. Fax. +7 (095) 2302043/2302630. Telex 411964 ANS SU.)

Nickel metabolism and toxicology

7–11 September. 5th International Conference on Nickel Metabolism and Toxicology. Ontario, Canada.
(Prof. E. Nieboer, McMaster University, Department of Biochemistry, Health Sciences Centre, 1200 Main Street West, Hamilton, Ontario, Canada L8N 3Z5.)

Medicinal chemistry

13–17 September. 12th International Symposium on Medicinal Chemistry. Basel, Switzerland.
(XIIth International Symposium on Medicinal Chemistry, Administrative Secretariat, P.O. Box 141, CH-4007 Basel, Switzerland.)

Macrocyclic ligands

14–16 September. International Symposium on Macrocyclic Ligands for the Design of New Materials. Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Chairman, International Symposium on Macrocyclic Ligands for the Design of New Materials, Chemistry Department, University of Surrey, Guildford GU2 5XH, Surrey, UK.) Tel. +44 (483) 571281 ext. 2588. Telex 859331 G. Fax. +44 (483) 300803.)

Organic substances in soil and water

14–17 September. International Conference on Organic Substances in Soil and Water. Lancaster, UK.
(Miss C. Martin, Centre for Research on Environmental Systems, Institute of Environmental and Biological Sciences, University of Lancaster, Bailrigg, Lancaster, LA1 4YQ, UK. Tel. +44 (524) 6520. Fax. +44 (524) 843854.)

Analytical chemistry

20–26 September. SAC 92: International Conference on Analytical Chemistry. Reading, UK.
(The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Polymer spectroscopy

End-September. 10th European Symposium on Polymer Spectroscopy. St. Petersburg, USSR.
(Prof. S. Skorokhodov, Institute of Macromolecular Compounds, USSR Academyc of Sciences, Bolshoi Prospekt 31, St. Petersburg, 199004, USSR.)

Mycotoxins and phycotoxins

8–12 November. 8th International Symposium on Mycotoxins and Phycotoxins. Mexico City, Mexico.
(Dr D. L. Park, Department of Nutrition and Food Science, 309 Shantz Building, University of Arizona, Tucson, Arizona 85721, USA. Tel. +1 (602) 6215107. Fax. +1 (602) 6219446. Telex 187167 AZUTUC UT.)

1993

Bioorganic chemistry

7–10 June. 2nd International Symposium on Bioorganic Chemistry. Fukuoaka, Japan.
(Symposium Secretariat, 2nd International Symposium on Bioorganic Chemistry, Department of Chemical Science and Technology, Faculty of Engineering, Kyushu University 36, Higashi-ku, Fukuoka 812, Japan. Fax. +81 (92) 6321842.)

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Official Journal of the International Union of Pure and Applied Chemistry

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- to co-operate with other international organizations which deal with topics of a chemical nature;
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Front cover: The Safi plant, Morocco, in 1965. (*Photo courtesy UNESCO/Cart.*)

International Union of Pure and Applied Chemistry

Polymer recycling '91

An IUPAC-sponsored International Symposium on Recycling of Polymers — Science and Technology — was held at the Don Carlos Hotel, Marbella, Spain, on 18–20 September 1991.

A variety of methods are currently or potentially available for the management of plastic waste: land-fill, incineration, chemical degradation, biodegradation, and recycling. Management of such waste must take into account ecological, political, social, logistic and economic as well as technological aspects. These issues were addressed at the IUPAC International Symposium on Recycling of Polymers — Science and Technology held at the Don Carlos Hotel, Marbella, Spain in September 1991.

The scientific programme was devoted to the following topics: technological advances for work-up of waste; polymer modification by pyrolysis, solvolysis and hydrogenation; processing of plastic waste; increasing the quality of recycled polymers; unsolved problems in polymer recycling. The following key-note lectures were presented: 'Plastics waste management in Europe' by F. W. Mader (The European Centre for Plastics in the Environment, Belgium); 'Present Situation and prospects of Japan's waste plastics recycling technologies' by R. Iijima (Plastic Waste Management Institute, Japan); 'A perspective of the plastic waste issues in the USA' by R. N. Liesemer (The Council for Solid Waste Solutions, USA). The proceedings will be published in a forthcoming issue of the journal *Die Makromolekulare Chemie: Macromolecular Symposia*.

Separation technology

In the section on Technology Advances for Work-up of Waste, Richard A. Fleming (Du Pont Polymers, USA) presented a lecture on 'Chemical/compositional separation technology of used polymers.'

He pointed out that the US plastics industry has launched a variety of initiatives related to the 'municipal solid waste issue.' Some are educational in nature and some involve sponsored research. The Council for Solid Waste Solutions additionally provides a forum for industry interaction with legislators, environmentalists and concerned citizens. While these activities are important and necessary, responsiveness of the plastics industry ultimately will be judged on pounds of plastics recovered and reused.

In 1989, Du Pont and Waste Management of North America (WMNA) formed a joint venture — The Plastic Recycling Alliance (PRA). WMNA supplied baled mixed plastic bottles from their residential curbside collection programs. PRA separates bottles by type, grinds them, separates the chips by polymer type and converts them to clean polymer. Du Pont then uses or sells the final product. The first two plants now have been operating for about one year.

Fleming discussed some experiences of the first year of plant operation. He noted changing industry commitments on feedstock and significance to operation of recycle plants. He also addressed customer requirements as well as the state of industry standardization on specifications for feedstock and product. He then summarized and assessed the state of development of instrumentation and automated technology for bottle or chip separation. Technology development is needed to augment or replace manual sorting and to continue the improvement of product quality while reducing plant operating costs.

Finally, Fleming assessed three alternative approaches to plastics recycling: direct recovery without polymer modification (the PRA approach), methods involving depolymerization then reuse of monomers, and methods involving reduction of polymer to gases and low-molecular-weight oils.

Official IUPAC Representative Prof. Takeo Saegusa (KRI International Inc., Japan) welcomes participants at the opening ceremony.

Surface treatment of poly(vinyl chloride)

In the same section, Christian Decker (Laboratoire de Photochimie Generale, CNRS, Mulhouse, France) spoke about 'Recovery of photodegraded polymers by surface treatment' with particular reference to PVC.

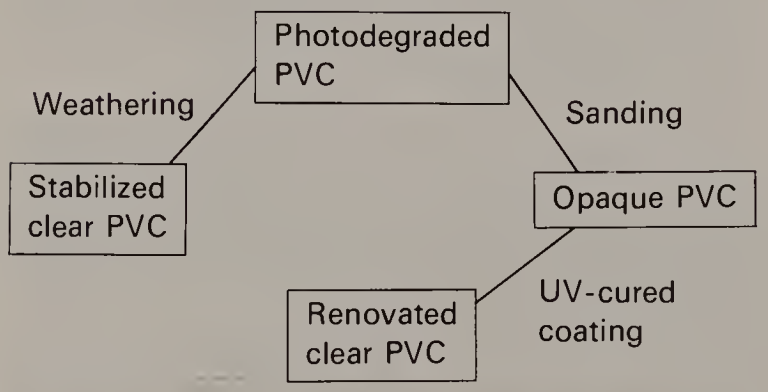
Most of the polymer materials used in outdoor applications are known to undergo photodegradation on weathering, which ultimately leads to discoloration, chalking, brittleness and a drop in mechanical performance. The addition of light-stabilizers, that filter the harmful UV sunlight, permits to improve greatly the polymer durability, but it concentrates the degradation process in the O_2-rich top layer, which still receives essentially unfiltered radiation.

A two-step surface treatment has been developed in order to recover the original properties of strongly photodegraded polymers, thereby extending their

lifetime. This process has been applied to PVC, one of the thermoplastic polymers that exhibits the greatest sensitivity toward photo-oxidation. Clear plates of highly stabilized PVC were exposed to accelerated weathering until discoloration and brittleness had developed substantially. The 50-μm top layer was then removed by sanding: this simple treatment makes the colour disappear and restores the initial impact resistance of PVC, but at the detriment of the transparency, which is lost due to the frosted surface.

In the second step, a thin film of photopolymerizable acrylic resin was sprayed onto the PVC plate, which thus recovered its original transparency. A 1-second exposure to an intense mercury lamp was sufficient to obtain a hard, tack-free coating. When adequate photostabilizers were added to the UV-curable resin, the recovered PVC was found to be five times more resistant to weathering that the starting material. In addition to their photoprotective action, such coatings also impart new properties to the coated polymer, in particular an outstanding resistance to organic solvents, moisture, acidic or saline pollutants, as well as a better resistance to abrasion and scratching.

One of the great advantages of this fast and inexpensive recycling treatment is that it is based on existing well-tried technologies, and that it can be carried out on site, directly on the plastic structures to be renovated. Such a work up of waste process was found to be also operative for opaque PVC, and should basically apply to other polymers as well.



Watergas from plastic waste

The section on Polymer Modification by Pyrolysis, Solvolyis, and Hydrogenation included a paper on 'Watergas from plastic waste and its possible uses' presented by Dr Joachim Semel (Hoechst AG, Frankfurt, FRG).

Semel said that in recent years cost comparisons have shown that the incineration of plastic waste and the subsequent use of the generated heat can be two or three times more expensive than the direct disposal of waste in landfills which is currently in use.

Direct disposal in landfills has the disadvantage of requiring enormous volumes and this method does not use the energy stored in plastics. Incineration, on the other hand, uses the heat generated and reduces the waste volumes drastically. However, it generates CO_2 during the burning process.

Recycling by gasification of plastic waste and conversion of the gaseous products to chemical raw materials (watergas for synthesis of methanol and other alcohols, CO and H_2) has obvious advantages: the volume of waste is reduced substantially; the energy released can be used and the production of CO_2 and its release into the atmosphere is minimized.

Hoechst have therefore initiated studies to investigate how the above recycling methods compare in terms of cost, CO_2 and waste volumes. The High-Temperature–Winkler process of Uhde GmbH was selected as the basic process for the gasification of plastic waste. Semel pointed out that because no experimental data were available, the analysis was based mainly on theoretical considerations.

The studies at Hoechst show that in the present situation the recycling of plastic waste is still about 2–2.5 times more expensive than direct disposal of plastic waste in landfills. Plastic-waste incineration and use of the heat evolved is, in terms of cost, the best recycling option.

Incineration and gasification of plastic waste leads to a reduction of waste volume by a factor of 4.5. The amount of CO_2 released to the atmosphere is lowest when plastic waste is gasified.

From left: Dr Richard A. Fleming (US) who spoke about 'Chemical/compositional separation technology of used polymers'; Dr Rinzo Iijima who presented a keynote lecture on Japan's waste plastics recycling technologies; Symposium Chairman and IUPAC Macromolecular Division President Prof. Walter Heitz (FRG); and Dr Popkin Shenian (USA) who lectured on 'Radlite – a new technology for commingled plastics.'

Plastics such as polyethylene sheeting are used increasingly to improve agricultural production, especially in developing countries. Such plastics account for a significant proportion of plastic waste. (*Photo courtesy Shell.*)

Recycling of plastic waste in Japan

The second day of the meeting commenced with a keynote lecture by Dr Rinzo Iijima (Plastic Waste Management Institute, Japan) on the 'Present situation and prospects of Japan's waste plastics recycling technologies.'

Iijima indicated that in Japan, full-scale waste–plastic recycling business started around 1970. Since then, in parallel with the efforts to develop new uses of recycled products, remarkable progress has been in recycling/molding technologies.

The most popular recycling/molding technologies applicable to thermoplastics are of the melt-and-mold type. Iijima discussed the technologies currently used for such recycling methods comparing the benefits and disadvantages – especially economic considerations. Because quality standards are now set for some recycled products, the relationship between a particular recycling technology, the product's physical properties and the quality standards is especially important.

Iijima also considered waste-derived solid-fuel manufacturing technologies and incineration technologies linked with thermal energy recovery.

Recycling poly(ethylene terephthalate)

One of the lectures in the section on Processing of Plastic Waste was presented by Dr Walter De Winter (Agfa–Gevaert N.V., Belgium). It was concerned with the recycling of PET.

De Winter pointed out that PET is one of the largest–volume recycled materials in the world. The PET to be recycled originates mainly from fibre and filament applications. Bottles, and to a lesser extent films used in packaging and support of photographic materials, etc., also contribute. The lecture surveyed the most common recycling methods for fibres and bottles and the possibilities for recovering films.

De Winter emphasized the melt-recovery method used by various manufacturers. This method is based on the same principles as the original equilibrium–polycondensation reaction: the desired molecular weight and molecular weight distribution of the PET are obtained by careful control of the reaction conditions.

The greatest difficulties arise from the presence of impurities and contamination. De Winter outlined the influence of these determining parameters on the recycling process and on the reusability of the recovered PET. He focused especially on the role played by oligomers.

Finally, De Winter noted that the combined recycling of PET-film support and of silver from the photographic emulsions layers and the interactions (contamination) between these processes was of special importance to the photographic industry.

Quality of recycled polymers

The final day of the symposium was devoted to a session on Increasing the Quality of Recycled Polymers and a panel discussion on Unsolved Problems in Polymer Recycling.

One of the papers in the lecture session was presented by Dr James J. Scobbo Jr (General Electric Corporate Research & Development, New York, USA) and entitled 'Compatibilization strategies for upgrading recycled plastics performance: use of reactive rubbery polymers.'

Scobbo explained that one of the inherent problems in the recycling of polymers involves the wide variety of immiscible and incompatible polymer resins. For this reason, it is important to keep scrap from different sources separate, especially if it is known beforehand that the compositions are significantly different. Approaches to upgrading the performance of the scrap streams can then be tailored to each stream.

The work of Scobbo and his team has been based, in part, upon one such approach. Reactive rubbery polymers have been used to modify several recycle streams. These models represent household scrap, business machine housings, and automobile bumpers.

Dramatic property improvements can be obtained if specific reactive rubbery polymers are matched to certain recycle streams. Also, Scobbo's group found that variability in the source and the composition of a given stream over time can dramatically affect results. Their findings underscore the inherent difficulty in developing a universal approach to the recycling of mixed plastics.

CHEMRAWN VIII

IUPAC

CHEMRAWN VIII — The World Conference on Chemistry and Sustainable Development: Towards a Clean Environment, Zero Waste and Highest Energy Efficiency — is the 8th in the continuing series of conferences devoted to Chemical Research Applied to World Needs (CHEMRAWN). The conference will be held in Moscow, Russia, on 6–9 September 1992.

The objectives of CHEMRAWN VIII are to:

- analyse the present state and define the requirements for the development of selected branches of industry based on chemical processes in the framework of a sustainable development strategy;
- help in the dissemination of information on clean technologies and on using waste as a raw material;
- recognize scientific achievements that can lead to revolutionary technologies in chemical production, pollution prevention, waste recycling and use, and stimulate international collaboration in such areas;
- elaborate strategic recommendations for policy and decision makers on the development of the branches of industry which have the most perceptible impact on the environment and on the health of population.

Plenary sessions and contributed poster sessions will include the following subjects:

A. Sustainable development strategies leading to a clean environment, to low- or non-waste processes and to highest energy efficiency: technological, economic and legislative aspects of the movement towards non-waste energy efficient production.

B. Recent progress in low- and non-waste technologies: chemical industry of polymers, agrochemicals, pharmaceuticals, dyes and basic organic intermediates; petroleum industry and oil refineries; aluminium and other non-ferrous metals industry; electroplating processes in industry including microelectronics; pulp and paper industry.

C. Clean technologies: emerging production technologies; industrial waste recycling and use as a raw material; information transfer networks for clean technologies.

D. Chemical methods for the elimination of large-scale environmental pollution and rehabilitation of natural systems.

E. Scientific achievements with the potential of inducing substantial changes in chemical science and industry.

The Co-Chairmen of the National Organizing Committee are IUPAC Past-President Prof. Valentin Koptyug and Prof. Oleg Nefedov who are Vice-Presidents of the Russian Academy of Sciences.

For further information contact: CHEMRAWN VIII Secretariat, Prof. V. Koptyug's Office, Russian Academy of Sciences, 14 Leninsky Ave., 117901 Moscow V-71, Russia. Telex: 411964 ANS SU. Fax: +7 (095) 230 20 43/230 26 30.

CHEMRAWN VIII will include sessions on low- and non-waste technologies in the chemical and petroleum industries. The conference will be held in Moscow (top right). Its Co-chairmen are Profs. Valentin Koptyug (right) and Oleg Nefedov (centre) seen here talking to IUPAC President Allen Bard (left).

Previous CHEMRAWN Conferences

CHEMRAWN I	Future sources of organic raw materials. Toronto, Canada, 1978
CHEMRAWN II	Chemistry and world food supplies: the new frontiers. Manila, Philippines, 1982.
CHEMRAWN III	Resources material conversion. The Hague, Netherlands, 1984.
CHEMRAWN IV	Modern chemistry and chemical technology applied to the ocean and its resources. Keystone, Colorado, USA, 1987.
CHEMRAWN V	Current and future contributions of chemistry to health. Heidelberg, FRG, 1986.
CHEMRAWN VI	Advanced materials for innovation in energy, transportation and communications. Tokyo, Japan, 1987.
CHEMRAWN VII	The Chemistry of the Atmosphere: Its Impact on Global Change. Baltimore, USA, 1991.

UN Conference on Environment and Development

The first United Nations Conference on Environment and Development (UNCED) will be held on 1–12 June 1992 at Rio de Janeiro, Brazil. Its goal is to create 'a global partnership between developing and more industrialized countries to ensure the future of the planet' according to Maurice Strong, Secretary General of the conference.

UNCED is meant to assure that environmental issues become central to policy making world-wide for the foreseeable future. As a mark of the importance the UN places on this conference, it has asked that its member nations be represented at UNCED by their heads of state.

The conference programme embraces issues on a wide variety of fronts, both scientific and economic. Among the goals of the conference is agreement on measures to eradicate world poverty, a heavy contributor to environmental degradation. Other issues to be addressed include:

One of the goals of UNCED is agreement on measures to eradicate world poverty, a heavy contributor to environmental degradation. (*photo courtesy UNESCO/Dominique Roger.*)

- protection of the atmosphere from climate change and pollution;
- protection of land resources from deforestation, desertification, soil loss and other threats;
- protection of freshwater and ocean resources;
- management of hazardous wastes and toxic chemicals;
- improvements in human health.

The conference intends to produce two major documents. The first is an *Earth Charter*, setting forth basic principles to govern world economic and environmental behaviour. The second, known as *Agenda 21*, is a detailed action plan that will establish an agreed-upon work programme for the international community in the coming decade and extending into the next century.

Other hoped-for results are mechanisms for technology transfer, signed conventions on climate change and other issues, and agreements on the funding to carry out the approved programmes.

The vast scope of this programme has called for extensive preparation world-wide. This began in 1989. A Preparatory Committee under the chairmanship of Tommy Koh of Singapore is overseeing this phase; it has continued to establish procedures and refine the agenda. Regional meetings have taken place for nations in Europe, Asia and the Pacific, and Latin America and western Asian countries. At least 125 nations are preparing reports giving their own perspectives. Non-governmental organizations will also be involved.

Conference organizers consider their most important challenge to be enabling developing countries to include environmental issues in their own development plans, by supplying both funding and technology. Such nations share in the consequences of environmental degradation, even when the problems may have been caused by the industrialized nations.

[Extracted from: EarthQuest, *p. 16, Fall 1991.] For more information on UNCED, contact the Secretariat, UNCED, Case Postale 80, Conches, Switzerland. Tel: +41 (22) 789 1676. Fax: +41 (22) 789 3536.*

ASCEND 21

The International Conference on an Agenda of Science for Environmental and Development into the 21st Century (ASCEND 21) was held in Vienna, Austria, on 25–29 November 1991. The following is the text of the final conference statement.

The nature of ASCEND 21

1. The International Conference on an Agenda of Science for Environment and Development into the 21st Century (ASCEND 21) was held in Vienna, Austria, from 25 to 29 November 1991. The objective was to define the agenda of science (a term used as encompassing the natural, social, engineering and health sciences) for the next 10–20 years relating to environment and development. The Conference was convened by the International Council of Scientific Unions (ICSU) in cooperation with several other organizations, and hosted by the Government of Austria.

2. The Conference recommendations provide:

- a perspective for the future direction of international science in the field of environment and development, and in related areas;
- a contribution by the scientific community to the United National Conference on Environment and Development (Rio de Janeiro, June 1992).

3. Some 250 invited persons from nearly 70 countries attended the Conference. Participants included natural scientists, health scientists, social scientists and engineers. Approximately half of the participants came from developing countries in Africa, the Arab region, Asia and Central and South America. The Conference was organized around three Sections, each meeting in parallel working sessions and followed by a plenary session to synthesize and draw up recommendations. The three Sections dealt with:

- problems of environment and development;
- scientific understanding of the Earth system;
- contributions of science to environment and development strategies.

Scientists are persuaded that if humankind does not alter its behaviour and priorities, unprecedented crises may ensue within the lifetime of a half of the world's present population.

4. The background papers, together with the summaries of the discussions at the parallel working groups and the presentations and discussions at the plenary sessions, will be published in April 1992 by Cambridge University Press on behalf of ICSU.

5. Stimulated by the call for ICSU to contribute to the United Nations Conference on Environment and Development (UNCED), and by the precedent set by the 1990 Bergen Conference, ASCEND 21 was an important landmark in the history of international science.

6. ASCEND 21 provided provided a unique platform to start a long-term partnership between the natural and the social sciences. It underlined the classical responsibility of all scholars to undertake research, to publish the results and to explain the implications for society. It asserted that it is especially important to draw attention to the implications of what is not known: the precautionary principle rests on the need to avoid disturbing a system that is inadequately understood. The Conference provided a model for a future *modus operandi* in which assessment of scientific results serves as a basis for predicting impacts and formulating policy options, leading to authoritative advice on the basis of international consensus among scientists. The Conference was characterized by a positive spirit of scholarly collaboration aimed at achieving culturally neutral analysis and recommendations for research and other action.

The problems

7. Achievement of sustainable societies requires an improved understanding of the complex forces which generate global environmental problems, and hinder social and economic development. The impacts of population pressure, over-consumption, land degradation, deforestation, climate change, loss of biological diversity, industrialization, waste accumulation, as well as water and energy use, on human society and the environment create major problems for which the skills of the scientific community will be critical in clarifying remedial policies and options for action. Scientists and technologists cannot by themselves solve the problems, but they can supply knowledge and informed opinion, as well as technical know-how, for consideration by governments and society. They can also assist in devising solutions.

8. The world faces serious inequities – economic, political and environmental – between countries and

Modern industry is becoming waste conscious. (*Photo courtesy Gist-Brocades nv.*)

within countries; the cause of these are complex. Along with high *per-capita* consumption rates there is a continuous and unacceptable process of impoverishment and deprivation aggravated by high population growth rates. The landless and the homeless are extreme examples. To survive, they almost inevitably compromise the sustainability of the natural resources available to them.

9. The precautionary principle was endorsed by ASCEND 21 as providing a scientifically sound basis for policies relating to complex systems that are so poorly understood that the consequences of disturbances cannot yet be predicted. According to this principle, highest priority should be given to reducing the two greatest disturbances to Planet Earth: the growth of human population and over-consumption of resources. Unless these disturbances are minimized, science will become powerless to assist in responding to the challenges of global change, and there can be no guarantee of sustainable development.

10. It is urgent to address the problems of growth in world population. Much can be done on the basis of existing knowledge: improving living standards and education, particularly of women; reducing infant mortality; providing acceptable means of contraception and developing other appropriate methods. Further scientific research is also needed to provide additional means of reducing population growth.

11. Policies for the management of per-capita resource consumption in the industrialized countries will have to be focused on energy and materials efficiency, recycling and economic regulatory mechanisms. There is also urgent need for behavioural research on ways to encourage alternative consumption patterns more compatible with global resource changes.

12. Recent decades are remarkable for the increasing rate and scale of transformation of the environment, with effects both locally and in distant regions of the globe; e.g. the stratospheric ozone hole in Antarctica resulting from CFCs released mainly in the Northern Hemisphere. But these are only early warnings. Scientists are persuaded that if humankind does not alter its behaviour and priorities, unprecedented crises may ensue within the lifetime of a half of the world's present population, arising from such changes as:

- world population doubling to 10 billion in only 35 years;
- migration and urbanization, assuming dramatic proportions, with notable consequences on coastal zones;
- continuing rise of energy consumption exerting increasing pressures on the global ecosystem;
- climate change, sea level rise and associated impacts on the biosphere;
- irreversible loss of a substantial part of the total number of living species;
- continued reduction and deterioration (including chemical pollution) of quality of the natural resource base including the exhaustion, degradation, salinization and loss of a major proportion of the world's soils;
- growing and widespread water scarcity.

13. Some countries are using up the stores of their natural environmental capital. This includes the excessive depletion of agricultural and forest resources, such as the transformation of prime agricultural land for urban and industrial development, the burning of fossil fuels at high rates and the pollution of water, land and air through toxic and other wastes. Trade in raw materials and natural resource products has added an international dimension to the depletion of the environmental endowment of humanity.

14. The factors conditioning land use and degradation are closely linked to population and resource use generally. Although there is no reliable picture of the extent or costs of land degradation or enough knowledge of the institutional arrangements needed to improve land use management, it is presently doubtful whether available land is sufficient for meeting growth in agricultural and non-agricultural demand worldwide projected for the next 35 years.

15. There is a disparity between energy consumption of the poor and of the rich. The production and use of fossil-fuel-based energy in the industrial countries causes transboundary pollution in the form of acidification and the world-wide build-up of atmospheric carbon dioxide, which has dangerous consequences for global warming. In view of the rapidly increasing demand for the heating, cooling, lighting and power services provided by energy, it will be essential to plan a new, more sustainable, more efficient energy supply system which delivers these services using less primary energy, generating less pollution and narrowing the rich–poor energy gap.

16. Although industrial activities have hitherto been associated with environmental pollution, modern industry is becoming waste conscious. In some sectors the current trend towards energy and raw materials efficiency and 'clean' production may be the precursor of a new era of industry, operating in a much more sustainable mode. The importance of clear and stable regulatory and financial signals from governments as a critical factor during such a transition phase needs to be emphasized. However, a crucial question for further research is the amount of time available for restructuring before environmental stress becomes widespread.

17. A significant portion of humankind, especially in developing countries, suffers from poor health owing to a variety of factors associated with poverty. Morbidity, especially in children, is closely linked to malnutrition, and environmental contamination with significant incidence of communicable diseases and avoidable disabilities. Preventive primary health care, adequate nutrition and an improved environment are central for long-term solutions.

18. In the framework of these issues, problems of environmental ethics are increasingly being discussed by a wide range of citizen, religious and scientific groups. Environmental ethics embrace many questions, including intergenerational equity and the ethical responsibilities of citizens and scientists in respect of the environment.

One bottle-neck appears to be the lack of scientists and engineers. (*Photo courtesy ICI Chemicals and Polymers*).

What can science do?

19. Earth is the only celestial body where life is known to occur and the only known habitable planet for man (the term 'man' being used generically to cover all human beings). This will only endure as long as the planet maintains its unique life-support function. All the three compartments of the land, oceans and atmosphere are connected with one another through the web of the interlocking biogeochemical cycles of water and nutrients. Together they form the Earth system that has evolved towards its present state of high complexity in continuous interaction with the biota that inhabit it, including man.

20. Systematic investigation on a global scale has only recently become feasible. But it has already been shown that our species has brought about alterations in the planetary life-support system which put the sustainable development of present and future generations at considerable risk. Enough is also known to identify – at least qualitatively – the main mechanisms (population, resource use, agriculture, industry) of human intervention, and to consider some of the impacts, and response strategies, including precautionary action needed to avoid disturbing an inadequately understood system as complex as the Earth system. This development marks the transition of man's status from that of a passive product of evolution towards a position in which humankind attempts to use its intelligence in the evolutionary process that includes itself.

21. Research results indicate the vast complexity of the system with its many dynamic interconnections and control mechanisms which display great variations in sensitivity: the relatively small increments made by man to the CO_2 flux into the atmosphere have a global climate impact, whereas man's doubling of the fluxes of sulphur and nitrogen compounds into the atmosphere has resulted in more regionalized impacts such as acidic deposition. We know that the collective, integrated mass of biota on earth are the prime pumps in the major biogeochemical cycles which are a vital part of the planet's life-support system, and we must gain more understanding of these interactions if we are able to manage the systems sustainably.

22. The lack of knowledge of control mechanisms and their sensitivity to disturbance must prepare society for surprises, which means that methodologies for impact assessment must closely follow research as it advances. For example, the impacts of natural disasters can be considerably reduced by focused Earth system research and technological solutions (e.g. through IDNDR). Such disasters, however, have effects directly related to high population densities and poverty.

23. Disturbances of the Earth system are most often the result of a sum of local actions while changes on the global scale, in turn, have results that may be local as well as global. Thus global change studies require iterative focusing on the global, regional and especially local scales at which changes are experienced most acutely.

24. Many of the institutional arrangements for embarking on systematic interdisciplinary investigation of the Earth system are now in place (e.g. GCOS, GOOS, HDGECP, IGBP, IHP, MAB, SCOPE, STEP, WCRP, etc.) and they are capable of delivering new data and more detailed model-based simulations, and hence new understanding and useful foresights to the extent that support is given to these programmes.

25. One bottle-neck appears to be the lack of scientists and engineers, and a supportive research context. This is particularly severe in certain disciplines and regions. In view of the lesser number of scientists in developing countries, focused capacity building is necessary to permit world-wide balanced participation in research as well as to enable developing countries to strengthen their scientific capabilities to solve local problems and to participate on the international scene, including in the negotiations of relevant international conventions. Existing regional networks for research and training should be supported and new ones established. A recent example is the initiation of the Global Change System for Analysis, Research and Training (START).

26. The process of understanding the Earth system is now beginning and, if intensified, will produce valuable results for sustainable development in the first decades of the 21st century. It will be of great importance to take stock periodically of advances made and of new priorities that emerge both from results obtained and surprises encountered and to share these with policy-makers and the public at large.

27. This is not the only role of science in sustainable development. Because it is now already abundantly clear that 'more has to be done with less', science and technology have a crucial role in raising productivity so as to make this possible. The challenge of shifting technological growth onto an ecologically sound path includes applying the precautionary principle without endangering the fulfilment of basic needs so as to achieve improved response strategies.

28. Science plays an essential role in the search for pathways to produce goods and services without degradation of the natural environment through:

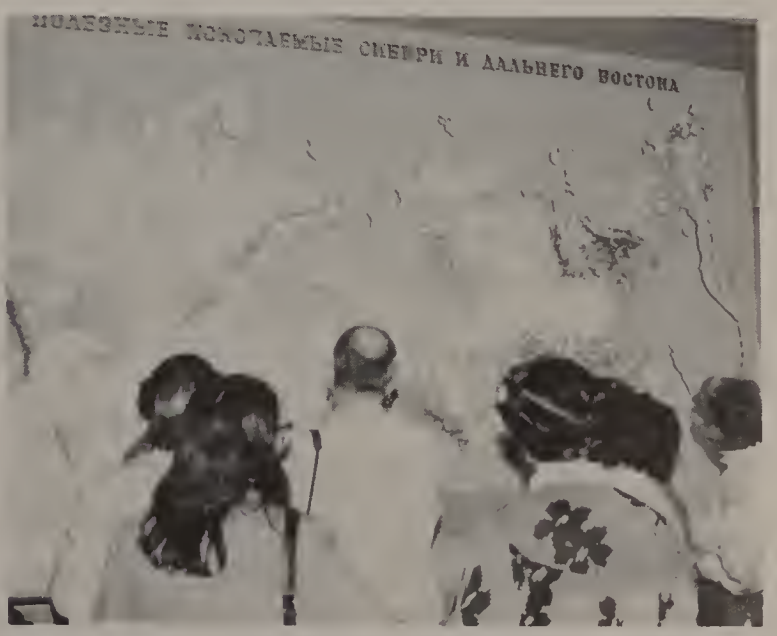
- better understanding of the Earth system, of its carrying capacity and of environmental change;
- scientific support for determination of priorities between competing development endeavours and assessment of economic and ecological tradeoffs;
- improved ways to cope with natural and man-made disasters and their effects, such as storms, floods, drought and war;
- economic analyses that embrace ecological factors and internalize environmental costs and benefits in the long-term;
- engineering studies for technological innovations that raise the efficiency of resource use and limit discharges;
- identification of development — environment interactions and emerging problems in specific areas.

29. Science can help resolve development issues on local, regional and global scales. The separate institutions charged with addressing these must work together because the different scales interact. The larger-scale environment picture must be considered as an essential overlay when addressing local and sectoral development problems. The Brundtland challenge to consider the welfare of the next generation calls for the lengthening of the time scale over which prediction is required and an intensification of the efforts to reduce uncertainties still further.

30. One of the contributions of science lies in its power to predict how the environment will change both through natural fluctuations and in response to Man's activities. Such predictions will include not only global average conditions but, more importantly, regional variation due to both global and local pollution of the atmosphere and ocean and their natural variability. Operational forecasting systems derived from research are needed to produce environmental predictions.

31. The role of the sciences in effectively linking environment and development is vital if the political and economic transformation of development patterns world-wide is to be put on a sustainable basis. This may call for science itself to become a more active partner in guiding development. A recognition of the link between science, environment and development should certainly help in this context.

32. Science must seek to improve public awareness of scientific principles and encourage greater participation to ensure that public concerns and indigenous understanding are taken into account. By the 21st century science should be more actively involved in helping to shape development in ways that guarantee environmental security for present and future generations.



Science can help resolve development issues on local regional and global scales.

Research is required to discriminate between environmental changes due natural fluctuations and those induced by anthropogenic forcing. (*Photo courtesy CIBA-GEIGY*.)

33. The Conference confirmed that the scientific community is willing and able to enter into partnerships with organizations charged with addressing problems of environment and development, in such areas as:

- understanding the natural resource system;
- availability of relevant data;
- informing society;
- understanding human behaviour in response to global and local change;
- laws relating to resources, environment and property (including parents);
- environmental ethics.

Recommendations

Research and monitoring of the Earth system

34. Research attention is needed to discriminate between environmental changes due to natural fluctuations and those induced by anthropogenic forcing, as a prerequisite for early warning of change.

35. The international global environmental research programmes, WCRP and IGBP, provide a clear strategy for research aimed at improving understanding of the total Earth system. The goals of these programmes should be vigorously pursued through related national projects.

36. There is a need for research directed towards improved understanding at the local and regional scales, of the hydrological cycle, including its interaction with soil and vegetation, and its response to changing land use and pollution, environmental degradation and rising industrial, agricultural and domestic demands, particularly in semi-arid regions. There is also a need to develop technology designed to raise efficiency of water use.

37. In order to establish more clearly the likely impact of climate change on natural and managed ecosystems and on society it is necessary to improve predictions of the regional characteristics of environmental change.

38. It is necessary to intensify interdisciplinary research on coastal zones where 75% of the world's population will live by the year 2000, and which will be receiving strongly increasing loads of nutrients and pollutants from the land, endangering its major role in marine food production through traditional fisheries and mariculture.

39. There is a need for research on the rapid and irreversible loss of biodiversity as a basis for developing appropriate management tools, with attention to strengthening human and institutional capabilities in critical areas. Because biodiversity depends on habitat, research should concentrate on biosphere dynamics, including anthropogenic influences, one of the goals being to promote restoration of degraded ecosystems.

40. Attention should be paid to integrated regional studies of vulnerability in fragile ecosystems (e.g. in mountains) or where environmental degradation threatens human well-being and capaicty to respond. These studies should emphasize the need to determine ways to promote ecosystem integrity.

41. There is a need to define and assess the carrying capacity of the Earth at all scales; to find acceptable ways to slow population growth; to reduce overconsumption; and to examine alternative consumption patterns and lifestyles.

42. There is a need to establish operational systems for environmental forecasting (based on research models and supplied by new kinds of data) to predict how the environment will change globally, regionally and locally in the atmosphere, oceans, coastal seas and the biosphere.

43. All components of the Earth system (including atmosphere, ocean, land surface, cryosphere, hydrosphere and biosphere) must be monitored on a global basis and in sufficient detail as a basis for detecting and predicting environmental change. This requires support for substantially enhanced programmes of Earth System observation planned under the WWW, GAW, GEMS, GCOS and GOOS. Appropriate means need to be developed for the management of data obtained from those observing systems, including, storage, analysis, quality control, dissemination, free exchange between researchers and assimilation into numerical models.

Research on impacts and responses

44. Research is needed to predict the impact of changing land use on the environment and on options for land development and increasing productivity. Account needs to be taken of the widest possible range of factors, such as urbanization, land allocation, loss of soil fertility, agriculture and forestry and the

ability to sustain biodiversity. Attention should be given to classification of landscapes in terms of sustainability.

45. Further research is required on the impact of waste and pollution on public heath and on ecosystems, in particular on alternative modes of avoiding and controlling solid, liquid and gaseous pollution, including the use of economic mechanisms, through increasing process efficiency and waste recycling.

46. Research and development is needed on the epidemiology associated with dietary patterns and nutritional states, the production of new vaccines and the social factors controlling their distribution and use. Improved disease and health indicators need to be designed and implemented, and the factors affecting the spread and control of old and new diseases should be researched.

47. An interdisciplinary research programme is needed on the technical, economic and sociopolitical implications of timed and costed transitions to a more efficient energy supply system and lower energy-intensive pathways in industry, agriculture, and transportation.

48. There is a need for improved yardsticks to measure quality of life and to define alternative development objectives which contribute to sustainable use of resources. Improved monitoring is needed of social and economic processes, in particular as they relate to population growth and modes of consumption, settlement patterns, health, epidemiology and related factors.

49. Attention is needed in future research on human attitudes and behaviour as driving forces central to an understanding of the causes and consequences of environmental change and of human responses to them.

Science and policy

50. There is a need for increased integration of the natural and social sciences in order to address the issues of environment and development.

51. In devising and implementing development strategies, existing scientific knowledge often goes unused. Natural, social and engineering scientists, working through their professional organizations, should regularly produce appraisals of the more-urgent problems in environment and development.

52. An international forum should be established to facilitate improved links between scientists and development agencies.

53. Current scientific capacities are inadequate to respond to the challenges posed by the cries of development, environmental degradation and rapid global change. Special efforts are required in education and in building up scientific institutions in particular in developing countries in order to allow them to join in international environmental programmes. New methods and approaches must be developed to facilitate the participation of all sectors of society in environmental matters in the transition to sustainable development. The role of women in relation to the environment should be recognized in this context.

54. The organization of science should be adapted in order to cope with the explosive growth in scientific literature, meetings and institutions, to encourage creativity and to reduce the inequalities in access to and distribution of scientific literature and information.

55. Increased efforts should be made by scientists to communicate with policy makers, the media and the general public about the implications for society of the results of their research.

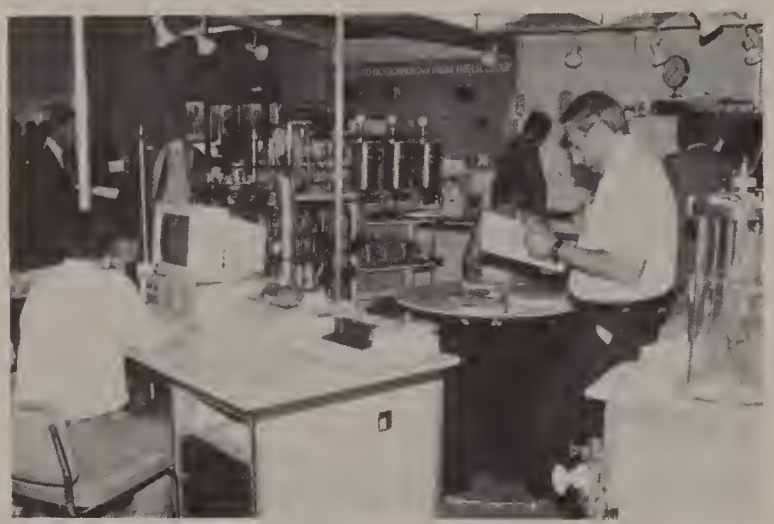
56. Continued efforts should be made to build bridges between leaders of science business and industry and consumers.

An interdisciplinary research programme is needed on lower energy-intensive pathways in industry, agriculture, and transportation. (*Photo courtesy Shell.*)

57. A mechanism needs to be established to examine the effectiveness of the institutional arrangements of science for the furtherance of the environment and development process discussed during the ASCEND 21 Conference.

58. Further development of institutional arrangements for the stewardship of the World's Commons including the ocean beyond exclusive economic zones and the Antarctic, should be based on the best available scientific knowledge.

59. The international scientific community should undertake a wide review of environmental ethics related to such issues as: the intrinsic value of nature; environmental rights of citizens; intergenerational rights; communal rights for common properties (atmosphere, oceans, etc.); environmental codes of conduct; and ethical responsibilities of scientists and of the world scientific community.



The organization of science should be adapted to cope with the explosive growth in scientific literature, meetings and institutions.

Acronyms and abbreviations used in ASCEND 21 conference statement

ESF:	European Science Foundation
GAW:	Global Atmospheric Watch
GCOS:	Global Climate Observing System
GEMS:	Global Environmental Monitoring System
GOOS:	Global Oceans Observing Systems
HDGECP:	Human Dimensions of Global Environment Change Programme
ICSU:	International Council of Scientific Unions
IDNDR:	International Decade for Natural Disasters Reduction
IGBP:	International Geosphere-Biosphere Programme
IHP:	International Hydrological Programme
IIASA:	International Institute for Applied Systems Analysis
ISSC:	International Social Science Council
MAB:	Man and the Biosphere Programme
NAVF:	Norwegian Research Council for Science and the Humanities
SCOPE:	Scientific Committee on the Problems of the Environment
SEI:	Stockholm Environment Institute
STEP:	Solar Terrestrial Energy Programme
START:	Global Change System for Analysis, Research and Training
TWAS:	Third World Academy of Sciences
UNCED:	United Nations Conference on Environment and Development
WCRP:	World Climate Research Programme
WWW:	World Weather Watch

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *CI* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of national/regional centres appeared in *CI*, Vol. 14, No. 1, p. 25, 1992.

Nomenclature, symbols and definitions in electrochemical engineering

This document treats performance parameters in electrochemical engineering. Nomenclature and definitions for electrochemical engineering together with the respective symbols are given. Parameters to account for electrochemical reactions in electrolysis as well as for electrochemical power sources (electrochemical energy generators) are including in this document.

Comments on the document are welcome and should be sent by 31 December 1992 to: Prof. G. Gritzner, Institut für Chemische Technologie Anorganischer Stoffe, Johannes Kepler Universität, A-4040 Linz, Austria.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Intrinsic characterization of continuous fibre-reinforced thermoplastic composites. 1. Toughness characterization of carbon-fibre–polyether-ether-ketone (CF–PEEK) laminates

After reviewing some of the early studies of toughness measurement of continuous carbon-fibre-reinforced polyether ether ketone (PEEK), this work reports on some experimental studies of toughness measurements conducted by eight independent laboratories. The measurements were of two types; either plate-type specimens of angle ply specimens studied by instrumented falling weight impact or by the adoption of linear elastic fracture mechanics on unidirectional laminates.

The comparative measurements are supplemented by additional observations that enable an objective interpretation to emerge from the data from the eight laboratories. The fracture mechanics parameters for assessing toughness provides a reasonable agreement on the measurement of toughness and indicates that the isotropic geometry functions that are necessary in the analysis of the data work well for unidirectional laminates.

The agreement is far from good for the instrumented falling weight impact data and some explanation for this is discussed.

This report was prepared for publication by D. R. Moore and J. C. Seferis, Working Party on Structure and Properties of Commercial Polymers, Commission on Polymer Characterization and Properties, Macromolecular Division, and published in PAC, *Vol. 63, No. 11, pp. 1609–1625, 1991.*

Determination of molybdenum in biological materials

The accurate determination of molybdenum in biological materials is of considerable importance because of the essential role played by this element in human metabolism. However, data on the Mo content in biological samples and especially in clinical materials are often contradictory due to the inadequate sensitivity and reliability of the instrumental techniques used and to insufficient control of contamination during the analytical procedure.

Despite recent developments in Mo determination by electrothermal atomic absorption and plasma atomic emission spectrometry, measurements in human blood and serum remain beyond the scope of most hospital laboratories involved in the usual routine testing. Further development of atomic spectrometric methods or a wider availability of neutron activation analysis may provide more data which is required for a better understanding of the nutritional role of Mo and its metabolism in humans.

Advantages and limitations of the analytical techniques used for the determination of Mo in biological materials are critically discussed with particular attention given to clinical samples. The most common sources of analytical error are discussed and methods for their reduction are given.

This report was prepared for publication by Zygmunt Marczenko and Ryszard Lobiński, Commission on Microchemical Techniques and Trace Analysis, Analytical Chemistry Division, and published in PAC, *Vol. 63, No. 11, pp. 1627–1636, 1991.*

Analytical techniques for trace organic compounds. III. Mass spectrometry in trace organic analysis

Mass spectrometry is a very sensitive and structure specific method for qualitative and quantitative analysis. The commercially available instruments achieve mass separation by various principles, such as magnetic deflection, quadrupole fields, ion cyclotron resonance or time-of-flight. Direct combination of a mass spectrometer with chromatographic separation represents a powerful analytical tool. Depending on the analytical problem at hand, various ionization techniques can be used.

This report was prepared for publication by Klaus Biemann, Working Group on Organic Trace Analysis, Commission on Microchemical Techniques and Trace Analysis, Analytical Chemistry Division, and published in PAC, *Vol. 63, No. 11, pp. 1637–1646, 1991.*

The extrapolation of EMF data to infinite dilution in non-aqueous and mixed solvents

It is desirable that the determination of the standard E^0 of reversible cells in non-aqueous or aqueous–organic-solvent mixtures be performed according to more uniform criteria. In particular, E^0 values for a cell

of the type $Pt|H_2|HX(m$, in solvent $s)|AgX|Ag|Pt$ are needed for the determination of pH_s standards according to the IUPAC rules.

The procedure described here covers the whole range of relative permittivities ε of solvents and, while it provides a sound independent basis for verification of E^0 values as hitherto obtained ($\varepsilon \not< 10$) by the variety of existing procedures, it is the only available method applicable to the critical range of relative permittivities below $\varepsilon \approx 10$.

This report was prepared for publication by Y. Marcus and T. Mussini, Commission on Electroanalytical Chemistry, Analytical Chemistry Division, and published in PAC, *Vol. 63, No. 11, pp. 1647–1658, 1991.*

Determination of benzo[*a*]pyrene in oils and fats by reversed-phase high-performance liquid chromatography. Results of a collaborative study and the standardized method

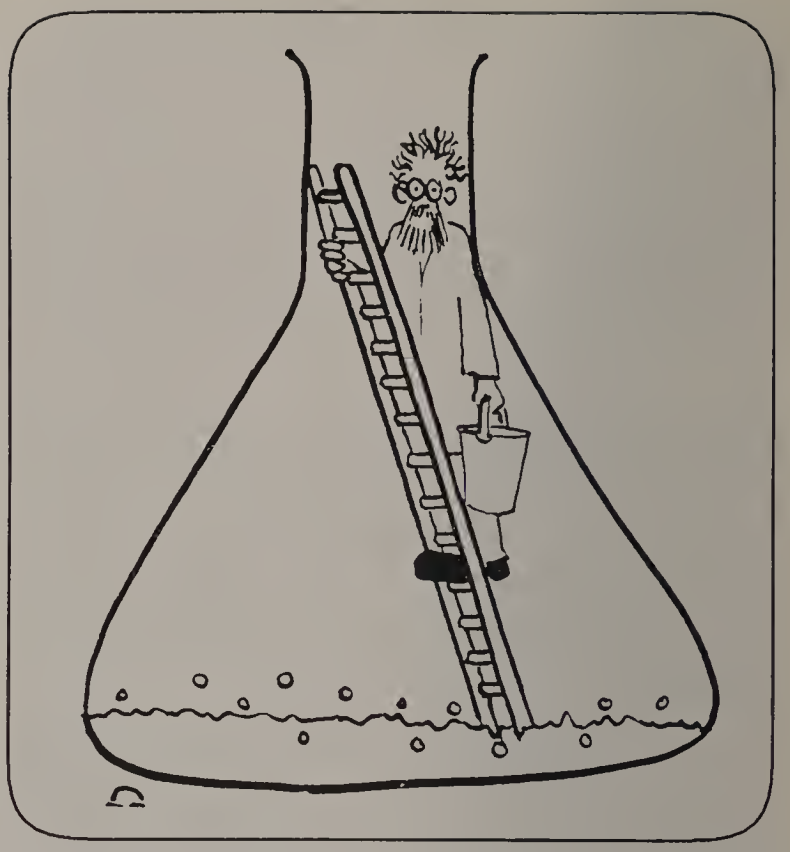
A description is given of the development by collaborative study of a standardized method for the determination of benzo[*a*]pyrene in crude and refined oils and fats by reversed-phase high-performance liquid chromatography and fluorimetric detection. The procedure is rapid and allows determination at levels of 1–10 μg/kg.

This report was prepared for publication by P. W. Hendrikse and A. Dieffenbacher, Commission on Oils, Fats and Derivatives, Analytical Chemistry Division, and published in PAC, *Vol. 63, No. 11, pp. 1659–1666, 1991.*

The use of quantitative structure–activity relationships for predicting rates of environmental hydrolysis processes

With the aim of setting up an evaluation on the use of QSARs for the prediction of various transformation processes, first of all a short introduction is given on the general principles that form the fundamentals of most QSARs developed so far. Thereupon a review, including the limitations of the relations presented, is given of the QSARs available at the moment for the calculation of rates of chemical hydrolysis of organic substances in the environment.

On the basis of the results obtained general recommendations are given on the application of QSRs for the prediction of environmental process parameters. The review is restricted to the process of chemical hydrolysis, being a rather ubiquitous, environmentally relevant transformation route which is well described in literature and for which a relatively large number of QSARs have been developed so far.



This report was prepared for publication by W. J. G. M. Peijnenburg, Commission on Water Chemistry, Applied Chemistry Division, and published in PAC, *Vol. 63, No. 11, pp. 1667–1676, 1991.*

Kinetic parameters of the electrode reaction: $2Cl^- \rightleftarrows Cl_2 + 2e^-$

In this document, the compilation of the kinetic parameters of the above electrode reaction at various electrodes and in various electrolytes is presented – covering up to the year 1989.

The chlorine evolution reaction is one of the most important and interesting reactions in electrochemistry, both from the practical viewpoint of electrochemical technology and from the fundamental viewpoint of electrocatalysis.

The data were extracted from the databank at Electrochemical Data Center, Yokohama National University. The data are tabulated as much as possible in the form they are reported in the literature.

This report was prepared for publication by Koichi Tokuda and Katsumi Niki, Commission on Electrochemistry, Analytical Chemistry Division and published in PAC, *Vol. 63, No. 12, pp. 1759–1779, 1991.*

JCAMP-DX, a standard format for exchange of infra-red spectra in computer readable form (Recommendations 1991)

The project committee recommends the use of JCAMP-DX to standardize infra-red spectral data for ease in transmission between infra-red spectrometer data systems and between such systems and other

computers. JCAMP-DX is a standard file format that supplies specifications for encoding digitized spectral data, including all the information needed to plot and label a spectrum, as well as additional information about a sample (such as sample preparation and properties), instrumental parameters, and sampling and computational procedures.

The digital output (the spectra, interferograms, transformed spectra, and peak tables) from any type of infra-red spectrometer can be handled using JCAMP-DX. Data encoded using JCAMP-DX specifications consist of printable ASCII characters and are acceptable to all computers and data systems. The committee recommends that data be carefully documented within JCAMP-DX files.

IUPAC-acceptable names and units should be used. Restrictions are applied to some of the JCAMP-DX specifications and additional requirements are given in order to meet IUPAC standards.

This report was prepared for publication by Jeanette G. Grasselli, Commission on Molecular Structure and Spectroscopy, Physical Chemistry Division, in conjunction with the Working Party on Infrared Computerized Data Banks, and published in PAC, *Vol. 63, No. 12, pp. 1781–1792, 1991.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 12, No. 4, p. 147, 1990. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of February 1991 were taken into consideration when preparing the final report.*

Structure and mechanical properties of ultra-high-molecular-weight polyethylene deformed near melting temperature

Some physical properties of ultra-high-molecular-weight polyethylene (UHMWPE) were studied in regard to its molecular weight. The main samples employed in this work were three grades of commercially available UHMWPE.

UHMWPE is known as a high-performance linear polyethylene with excellent physical properties. Owing to its high molecular weight and the presence of entanglements of molecular chains, UHMWPE has a very high melt viscosity.

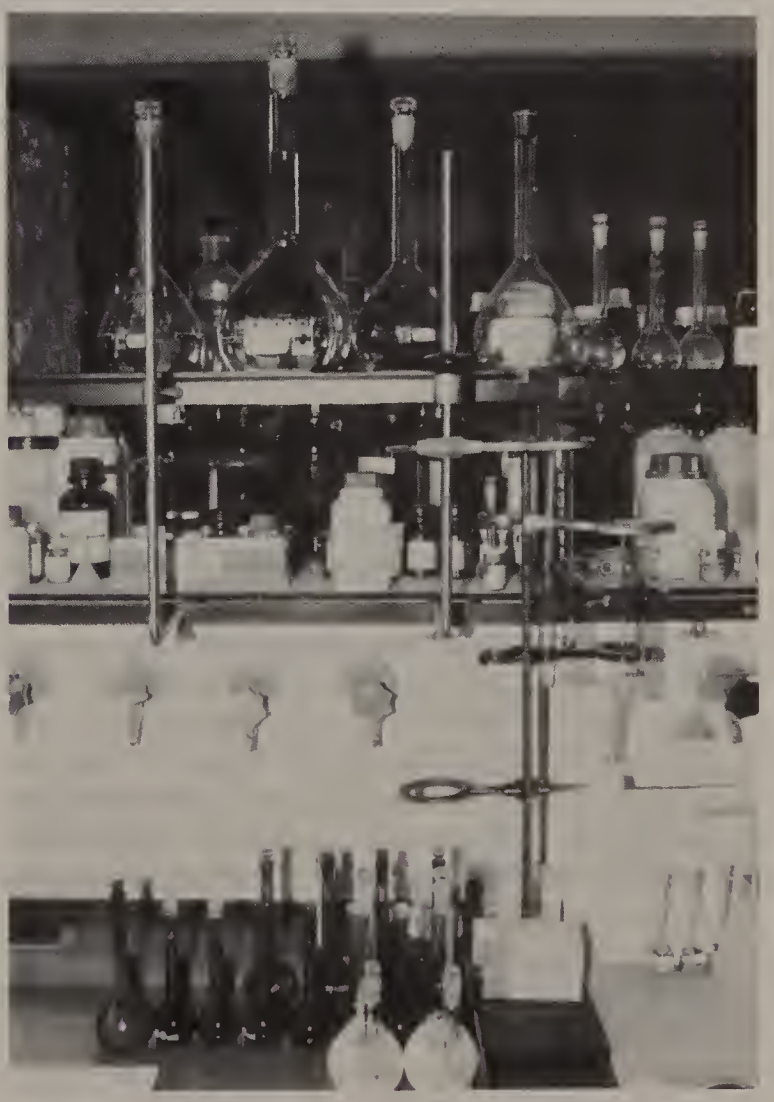
The object of this report is to investigate the effect of molecular weight on microstructure and mechanical properties of UHMWPE. The following items are discussed: powder properties of UHMWPE, relationship between properties and molecular weight, and drawabilities at various temperatures. The characteristic features are higher drawability of UHMWPE in the molten state and high tensile moduli of hot drawn sheets. Structure of hot drawn UHMWPE sheets was also discussed.

This report was prepared for publication by K. Kakayama, A. Furumiya, T. Okamoto, K. Yagi, A. Kaito, C. R. Choe, L. Wu, G. Zhang, L. Xiu, D. Liu, T. Masuda, and A. Nakajima, Working Party on Structure and Properties of Commercial Polymers, Commission on Polymer Characterization and Properties, Macromolecular Division and published in PAC, *Vol. 63, No. 12, pp. 1793–1804, 1991.*

Present and future status of organic analytical reagents – Part III: Organic analytical reagents in electroanalysis

This report indicates the various applications of OAR in electroanalysis. Because it is not possible to show all applications in the literature, some pioneering papers as well as selected only recent publications and reviews are cited. It must be emphasised that there is an increasing interest in the field, particularly where the electrochemical properties of OAR are used for modification of electrochemical reactions at electrodes.

This report was presented for publication by Adam Hulanicki and Stanislaw Glab, Commission on General Aspects of Analytical Chemistry, Analytical Chemistry Division, and published in PAC, *Vol. 63, No. 12, pp. 1805–1826, 1991.*



The December 1991 *PAC* included a report on the present and future status of organic analytical reagents.

Commission & Committee News

The following are reports of some of the commission and committee meetings which took place at the 36th IUPAC General Assembly in Hamburg in August 1991. They were submitted as 'Summary Minutes' by the chairman or secretaries of these bodies.

Tom Cvitaš: help needed with the French π mnemonic.

Can we accept the chemical amount?

The Commission on Physicochemical Symbols, Terminology and Units (I.1) has only two ongoing projects: the revision of the main manual of physical chemistry – the Green Book – and the dissemination of its contents within the community of chemists worldwide. Ninety per cent of the work at the Commission meeting in Hamburg revolved around the revisions that had to be prepared for the next edition planned to appear in 1992. Here are some sketches from our discussions:

The term 'amount of substance' for the old 'number of moles' seems still to bother many a chemist and so does the concept introduced in 1969 by Prof. Max McGlashan. 'Amount of substance' is no doubt a mouthful and even more so the 'amount of substance concentration' or 'amount of substance fraction'. To avoid such lengthy names the authors of the Green Book (1988) recommended the use of expressions such as '*amount* of sodium chloride' instead of '*amount of substance* of sodium chloride' for n(NaCl).

Similarly, the names of concentration and fraction were shortened to 'amount concentration' and 'amount fraction', which found disapproval in the Division of Clinical Chemistry. 'Amount' having a more general meaning was thought to be inadequate for describing the physical quantity n. Instead they preferred the name 'substance', which unfortunately has also a second meaning. Thus, they recommended the use of shortened versions 'substance concentration' and 'substance fraction' and, of course, no short form for 'amount of substance'. Feeling that the majority of chemists were on our side we gave preference to 'amount' and used it like that.

A further improvement could possibly be achieved by adding the attribute 'chemical' to amount whether there is a risk of confusion with the general meaning of the word. This was originally proposed by Prof. George Gorin (*J. Chem. Educ.* **59**, p. 508 (1982) and is slowly gaining supporters. However, some objections were raised: (i) the name 'chemical amount' might induce a student to think that there was a 'physical amount' also, and (ii) physicists might feel deprived by not having their own amount.

Having a distinguished physicist on our Commission we were reassured that physicists could live with a 'chemical amount' just as with many 'chemical substances'. After all, it will still remain a physical quantity. So in the 1992 edition two alternative names 'amount of substance' and 'chemical amount' will stand next to each other with a footnote on the practice in clinical chemistry and the future will show what chemists will accept.

New SI prefixes (*Le Système International d'Unités*, 6th BIPM, Sèvres 1991) extending the range of SI units by 12 orders of magnitude will be included in the new edition:

10^{-21} zepto z, 10^{21} zetta Z;
10^{-24} yocto y, 10^{24} yotta Y.

Sections on quantum mechanics and quantum chemistry, electromagnetic radiation, and chemical kinetics have been substantially revised and extended to include quantities used in these rapidly developing fields of physical chemistry owing to the application of computers and lasers.

Also a section on dimensionless qualities such as fractions, ratios, relative uncertainties, yields, etc. describing the use of %, ppm, ppb, . . . , a list of acronyms and a subject index will be added. So do not miss the new edition of this IUPAC bestseller when it appears in 1992!

And if you think that the mnemonic for π is too short in the Green Book (p. 82) look up the Japanese translation (October 1991) covering 30 digits behind the decimal point. If you can say "Live your life as luxuriously as your neighbours" in Japanese, you don't have to remember the value of $\sqrt{3}$ either. For those who are not so good in Japanese a Russian mnemonic for π (although admittedly shorter) can, of course, be found in the Russian translation of the Green Book. Can anyone help with the French version which we are said to have severely truncated?

The next meeting of the Commission will be held in Lisbon, Portugal, during the 37th General Assembly.

Prof. Tomislav Cvitaš

Student-oriented nomenclature book

A subcommittee chaired by Prof. C. J. H. Schutte met during the General Assembly in Hamburg to finalize a plan of action for the preparation of a student-orientated nomenclature book.

The group recognized the need for an IUPAC book containing definitions, nomenclature, symbols, units and terminology, based on previous IUPAC recommendations, for all those involved in the teaching and learning of chemistry at undergraduate level and for non-specialist users. The book will concentrate on the language and philosophy of communication in chemistry rather than consist of only rules and tables.

The time-scale for completion of the manuscript is 4 years with completion expected in 1995. The first draft should be available for discussion at the 1993 General Assembly in Lisbon, Portugal. The book will consist of 200–250 pages with 30–50 pages for each of the four main branches of chemistry and smaller allocations for macromolecular chemistry and biochemistry. The task group emphasized that the book should be inexpensive in order to appeal to individual users.

The members of the task group, restructured at the Hamburg General Assembly, represent the following IUPAC divisions and committees: Physical Chemistry Division and Publications Committee (Prof. C. J. H. Schutte, Chairman); Interdivisional Committee on Nomenclature and Symbols and Commission on Physiocochemical Symbols, Terminology and Units (Prof. T. Cvitaš); Inorganic Chemistry Division (Prof. G. J. Leigh); Committee on Teaching of Chemistry (Prof. J. D. Bradley); Organic Chemistry Division and Commission on Nomenclature of Organic Chemistry (Prof. H. A. Favre); Analytical Chemistry Division and Commission on General Aspects of Analytical Chemistry (Dr S. Głab).

The restructured group met at the IUPAC Secretariat in Oxford on 7–11 November 1991. During the meeting, the whole concept of the manual was reviewed and its contents and style determined. The group confirmed the project date of finalization in 1995 to coincide with the IUPAC General Assembly to be held in Guildford, UK.

A task group met at the IUPAC Secretariat in Oxford in November 1991 to review the concept, contents and style of a student-orientated nomenclature book.

Dr Gerd Olofsson, Secretary of Commission I.2.

Disagreement about copyrights

An important part of the work of the Commission on Thermodynamics (I.2) is the production of the critically evaluated tables of thermodynamic data. The IUPAC projects are published usually in the form of books by Blackwell Scientific Publications (BSP). One such project of the Subcommittee on Thermodynamic Data (STD) is the critical evaluation of heat capacities of pure liquid compounds. The data compilation and evaluation for 1557 compounds is completed and final typesetting of the camera-ready manuscript will start in the summer 1992. During a joint meeting between the Commission, STD and the Committee on Chemical Data Bases (CCDB) the distribution was discussed of a software package that may be prepared at the Institute of Chemical Technology in Prague from the database containing all background material. A difference of opinion about copyright ownership was revealed. STD suggested that the package could be distributed through the NIST Standard Reference Program which has experience in this matter. However, CCDB maintains that IUPAC owns the copyright to the database and therefore distribution must be through BSP. The question of when IUPAC ownership begins is unclear and needs identification. The copyright problem must be settled and it will have consequences for other present and future IUPAC projects.

The first volume of the *Electrolyte Data Book Series* dealing with methanol is in press. It contains recommended data for density, permittivity and viscosity for methanol in the range 223–333 K, conductance data for electrolyte solutions, transference numbers and single ion conductances. The second volume on ethanol and propanol solutions will be finished before the end of 1991.

The successful international collaboration in the preparation of *Experimental Thermodynamics*, Vol. 3, *Measurement of the Transport Properties of Fluids* (published 1991) has stimulated a proposal for a succeeding volume on the theory and prediction methods for values of transport properties.

The Commission has adopted new terms of reference one of which belong "to promote the understanding, teaching and use of thermodynamic princi-

ples, procedures and data." With this in mind a working party has been created to prepare a 'teacher' version of the Commission document *Standard Quantities in Chemical Thermodynamics: Fugacities, Activities, and Equilibrium Constants for Pure and Mixed Phases*.

The discussion of future projects was somewhat hampered by the uncertainty that still is felt at the grass-root level about the implementation of IUPAC's horizontal programmes 'Chemistry of Advanced Materials' and 'Chemistry and the Environment'.

The next meeting will be held at Snowbird, Utah, USA, on 15–16 August, 1992.

Dr Gerd Olofsson

Thermodynamic data

The work of the Commission on Thermodynamics Subcommittee on Thermodynamic Data is conveniently discussed under three main headings:

1. International Thermodynamic Tables of the Fluid State

Since the General Assembly in Lund, this on-going project to produce tables of internationally agreed values of thermodynamic properties for liquids and gases, carried out at the IUPAC Thermodynamic Tables Project Centre, Imperial College, London, has resulted in the publication of one volume and a report. Volume II, *Fluorine*, was published in July 1990, and a report on *Sulphur Hexafluoride* was published in 1991. This reports reviews the present experimental data, which are thermodynamically inconsistent. Work on this substance will be restarted when new measurements have been completed.

A volume on *Methanol* will be ready for publication in 1992 and work is proceeding on *Benzene*. Formal approval has been given for a revision of the volume on *Methane*. Possibilities for the future include a revision of the carbon dioxide volume, and projects on hydrogen and refrigerant 134a.

A package has been developed for the prediction of thermodynamic properties of mixtures using the high quality equations of state of the pure fluids.

2. Critical compilations

(a) *Heat capacities of liquids*
A specimen copy for review was prepared with an Introduction, Thermodynamic Background, Calorimetric Techniques, Previous Compilations, Data Treatment, Guide to Tables, Data on n-Alkanes, References and Formula Index. Favourable reviews from the 10 reviewers contained useful comments which will be incorporated in the final volume. Preparation of the manuscripts in camera-ready copy should be completed by early 1993.
(b) *Vapour-liquid critical properties*
The publication of the compilation and evaluation of the critical properties of pure substances will be carried out in 11 units. Preliminary drafts on straight chain alkanes, alkanols and inorganic compounds with critical temperatures less than 400 K are expected in 1992.
(c) *Activity coefficients in nonelectrolyte mixtures at infinite dilution*
Data evaluation is proceeding well with over 12 000 values stored in the data bank.

3. Project on vapour–liquid equilibria in 1-alkanol + n-alkane mixtures

Since the last general assembly, two highly successful IUPAC international workshops have been held. In September 1989, the 5th workshop took place in Gradisca d'Isonzo, and in May 1991 the 6th workshop was held in Liblice, Czechoslovakia, each with about 55 participants. Proceedings of these workshops appear in special issues of *Fluid Phase Equilibria*.

A final report containing recommended values for five key mixtures (methanol + hexane, ethanol + hexane, ethanol + hexadecane, butanol + decane and hexanol + hexane), and relevant properties for the pure components is being prepared.

A feasibility study for a new project on mixtures of alkanes and/or alkanols plus ethers is being carried out.

In addition, there was discussion over the question of ownership of copyright to databases which form the basis of IUPAC publications. This must be satisfactorily resolved before there can be further production of software packages in connection withn our IUPAC projects.

The next meeting will be held in Snowbird, Utah, USA on 14 August 1992.

E. S. Domalski and J. H. Dymond

Electrochemical kinetics

The detailed understanding of the kinetics of electrochemical reactions is important for both fundamental and practical reasons. Such knowledge can contribute to the understanding of the chemical properties of reactants and products. It can also aid in optimizing the operating conditions for industrial processes.

The Commission on Electrochemistry has completed four projects which impact on electrochemical kinetics. On the fundamental side, a project dealing with classification methods for multistep reactions will aid in providing a clearer mode of communication in this area. A second project concerning impedance methods collates a large body of literature dealing with time-dependent phenomena at electrodes.

On the practical side, a project concerned with terminology in electrochemical reaction engineering will provide a consistent language for describing the operating characteristics of an industrial process.

Finally, a project summarizing kinetic data for the electrochemical production of chlorine has been completed.

The Commission will continue its work at an off-year meeting in Coimbra, Portugal in September 1992.

George S. Wilson

Commission on Electroanalytical Chemistry

Prof. R. D. Buck and Dr Klára Tóth have been appointed as Chairman and Secretary respectively of the Commission on Electroanalytical Chemistry. Prof. Buck's address was published on page 231 of the November 1991 issue of *CI*. Dr Tóth's address is given in the Names and Addresses section below.

Red Book Part II

Following publication of *Nomenclature of Inorganic Chemistry: Recommendations 1990* (Red Book Part I), the highest priority of the Commission on Nomenclature of Inorganic Chemistry (CNIC) will be the completion of Red Book Part II by 1995.

While Red Book Part I outlines the general principles of inorganic nomenclature, Part II will present more-advanced aspects of nomenclature in specialized areas of inorganic chemistry. The editor of Red Book Part II is Prof. J. A. McCleverty. The book will contain the following chapters:

- Iso- and heteropolyanions;
- Isotopically modified compounds and hydron;
- Nitrogen hydrides and derived cations, anions, and ligands. Single-strand and quasi single-strand polymers;
- Inorganic rings and chains. Metal complexes of tetrapyrroles;
- Ligand abbreviations;
- Inorganic radicals.

Organometallic nomenclature will be another main task of CNIC in the coming years. It is envisaged that documents dealing with different aspects of organometallic chemistry will eventually form Red Book Part II. A joint CNIC–CNOC (Commission on Nomenclature of Organic Chemistry) working party will consider matters of overlapping interests between the two commissions. These include naming group 14 organimetallic compounds for which both "organic" substitutive nomenclature and "inorganic" additive nomenclature can be used.

The naming of organic ligands is a controversial topic in organometallic chemistry and a new working party has been assigned to study the problem. There is a need to develop structure nomenclature for organometallic clusters that could also apply to related compounds (boranes, inorganic cage compounds, etc.).

After general discussion, at its meeting during the Hamburg General Assembly last year, CNIC considered a document prepared by Prof. D. Coucovanis and compared the descriptor presented therein with the older descriptor by Casey, Evans and Powell. The former method gave better indication on the spatial relationships between the cluster atoms than the latter, but the latter was stronger in indicating connectivities between atoms. Since the two descriptors give complementary information on the structure of the given cluster, it was decided that a revised document will be prepared for the meeting next year which will combine these two descriptors.

A draft of a document on organometallic isomers was presented at the meeting. This document addressed questions such as extended π-systems, chirality, naming ligands and so on. A revised manuscript will be prepared for the next meeting.

The next meeting of CNIC will be held in Geneva, Switzerland, on 26–31 July.

Prof. Risto Laitinen

New Working Group on Quality Assurance

The Commission on Microchemical Techniques and Trace Analysis held its meeting for 1991 at the IUPAC General Assembly in Hamburg. In addition to this meeting, the Working Group on Organic Trace Analysis and the Working Group on Speciation of Trace Elements as well as the Subcommittee on Surface Analysis also held meetings.

Good progress has been made on a number of Commission projects which were reviewed at their meeting, and a number of projects are near to completion now. A total of eight new projects was proposed at Hamburg for approval by the Analytical Chemistry Division.

The Commission approved a new major new thrust on quality assurance of trace analytical measurements at this meeting, and formed a working group of eight persons in this area which will be chaired by Dr Wim Cofino. The new group proposed five new projects at the General Assembly to inaugurate its programme.

One of the important parts of the work of the Working Group on Organic Trace Analysis is on trace analyses relating to the environment. The Commission

Commission V.2 in Hamburg.

is making a significant contribution to the IUPAC Chemistry and Environment Programme through the efforts of this working group and the new Working Group on Quality Assurance. The Working Group on Speciation has a number of projects in progress and has proposed two new projects. The precise definition of speciation and association terms is being considered by IUPAC and the Working Group will contribute to the effort to produce good terminology in this area.

In view of the IUPAC desire for subcommittees to complete their tasks, the Commission decided, at Hamburg, to dissolve the Subcommittee on Surface Analysis.

The next meeting of the Commission will be held in Cordoba, Spain, on 13–15 September 1992.

Dr David G. Westmoreland

High-temperature and solid-state chemistry

The Commission on High Temperature and Solid State Chemistry saw two major projects, which will result in significant publications, completed at its Hamburg meeting. The first concerned the terminology and characterization of carbon for which a total of 108 terms have now been agreed and defined. The second is a database of high-temperature thermochemical data of the elements designed for use on a personal computer. The software is flexible and allows ready retrieval of the data and it is intended that publication will take place through the Committee on Chemical Databases.

Other projects that were reviewed and that are near completion include a complication of phase-transition terminology, a comprehensive publication on high-temperature mass spectrometric ionization cross-sections and the results of a collaborative group study, involving eleven laboratories participating world-wide, on the ionic conductivity of fluorite-structured solids.

The Commission also continued its work on the teaching of solid-state chemistry. This effort involves the identification of the contents of syllabi and the compilation of information on laboratory experiments.

The Commission reaffirmed its intention to play a full role in the IUPAC programme on Chemistry and Advanced Materials. Two new projects were initiated: the first has as its objective the characterization of carbonaceous materials and the new carbons; the second will make calculations on the equilibrium properties of high temperature superconductors.

Finally the Commission received reports on two conferences in which it was involved. The HTERM Conference in Orleans had an interesting session on materials in space and the International Symposium on Calorimetry and Chemical Thermodynamics which was held at Moscow.

The Commission has fixed its next meeting for Rome on 25–26 September 1992.

John Corish

Dr Werner Koch is Secretary of the Organic Chemistry Division.

Organic chemistry

The Organic Chemistry Division Committee met during the 36th IUPAC General Assembly in Hamburg, August 1991. The past biennium has been characterized by the active introduction of a series of inter- and intra-divisional horizontal programmes covering all three commissions of the Organic Chemistry Division.

At the same time, new high-impact activities were proposed and induced: a Working Party on Computerization of Nomenclature; a Working Party on Organic Synthesis; a Subcommittee on the Detoxyfication of Hazardous Chemicals and Chemical Warfare Agents; and finally the active participation of the division in the series of monographs 'Chemistry for the 21st Century.'

The Commission on Nomenclature of Organic Chemistry (III.1) met jointly with the Commission on Nomenclature of Inorganic Chemistry (II.2) for a half day. It approved a 'Guide for the use of IUPAC nomenclature for organic chemistry.' A 'Glossary of basic terminology of stereochemistry' was approved for submission to public review after consultation with Commission II.2 and the Commission on Physical Organic Chemistry (III.2). Reports on 'Phane nomenclature, Part I' and 'Nomenclature of fused and bridged rings' were also approved. The report 'Prefix names for acyl groups derived from oxo-acids of groups 15 and 16' has been completed for submission to referees and Commission II.2. 'Class names of organic compounds and reactive intermediates based on structure' – a joint project with Commission III.2 – is to be sent to referees. The report on 'Nomenclature of ions, radicals and radical ions' is ready for publication. A program for coordinating computer nomenclature interaction has been established, together with a comprehensive project for protocols for general unique ('preferred') names.

Two documents of Commission III.2 have been finalized: 'Guidelines for the presentation of quantum mechanical data in organic chemistry' and 'Guidelines for the publication of research in experimental organic chemistry.'

Besides the two joint projects with Commission III.1 – 'Class names of organic compounds and reactive intermediates' and 'Basic terminology of stereochemistry' the Working Party on Structure-Reactivity

Parameters and Relationships proposed a final report finalized at Hamburg. The second edition of 'Glossary of terms used in physical organic chemistry' is being reviewed after removal of inconsistencies with the 'Photochemical glossary'. The final document, scheduled for completion by 1993, is expected to be the starting point for a 'Compendium of IUPAC terminology in organic chemistry.' The 'Photochemical glossary,' 'Stereochemical terminology' and 'Class names' reports are to be incorporated as well. The commission has initiated two feasibility studies. The first one deals with 'Terminology in theoretical organic chemistry' and the second one with 'Molecular modelling.'

Three documents of the Commission on Photochemistry (III.3) were published in the period 1989–91 in *PAC*: (1) Recommended methods for fluorescence decay analysis; (2) Molar absorption coefficients of transient species in solution; and (3) Radical ions.

Two projects were finalized during the Hamburg General Assembly: a collection of terms on electron transfer to be included in an updated review of the 'Glossary of terms used in photochemistry' and a collection of experiments on photochemistry to be used in undergraduate teaching. Four new projects and feasibility studies were started at Hamburg: a project on methods for the analysis of transient absorption kinetic data, a project on the characterization and standardization of photocatalysis, a feasibility study on recommended protocols to report experimental data on water treatment using radiation (including light), and a feasibility study on photosentization of biological activity.

The Organic Chemistry Division business included the usual reports of previous meetings, of the President, and on divisional and commission activities, election of officers and members of the committee, approval of membership on the commissions, and consideration of the budget.

Dr Werner J. Koch

Isotope specific measurements as references

The status of the International Measurement Evaluation Programme (IMEP) on Cadmium in Plastics was reviewed by Dr Andrée Lamberty at the meeting of the Limited Lifetime Commission on Isotope Specific Measurements as References in Hamburg. This second IMEP was suggested by the establishment of laws in Denmark, Sweden and Switzerland which replaced a maximum limit on the Cd content of plastics used in automobile manufacturing.

CBNM (Geel, Belgium) established the reference value for Cd in four materials using isotope-dilution mass spectrometry (IDMS) to provide a closest-to-the-'true' value with a proven known uncertainty. These materials were then distributed as blind samples to interested laboratories. Results were discussed and participating laboratories convened at CBNM, Geel, Belgium (in September, 1991). Commission members were asked to return comments on the results by the end of August 1991.

The status of IMEP-3 on trace elements in water was presented by Dr John Moody. Two samples were ready for distribution. Finally, in the absence of Dr John Savory, Dr John Moody reported that the trace elements in serum were ready for distribution to members for characterization. Dr Kevin Rosman reported that his samples had already been received. A target data of April 1992 was established. It was decided that participating laboratories in the IMEP round would have 60 calendar days to report data. This would allow presentation of the data at the commission's 1992 meeting in Birmingham.

Commission Chairman Prof. Paul De Bièvre discussed the desirability of an agriculturally related matrix for furture IMEP rounds. Dr John Moody offered to look into the possibilities of some materials from various institutes all over the world.

De Bièvre also reported on the progress achieved for an iron-in-blood sample characterized at the Los Alamos Laboratory (USA). The characterization results should be available at the next meeting.

In conclusion, De Bièvre pointed to the considerable contribution the commission was making to the IUPAC Chemistry and Environment Programme. In this respect, the favourable comments of two observers, Dr Rob Herber (Netherlands) and Prof. Dr Henk Dans (Netherlands) were kindly acknowledged. All members were requested to consider carefully new members for inclusion on the commission for their expertise in definitive measurements and their potential contribution to the commission.

The next meeting of the commission will be held in Birmingham, UK, in June/July 1992.

Dr John R. Moody

Spectrochemical analysis

When the Commission on Spectrochemical Analysis (V.4) met in Hamburg, it saw the retiral of Prof. Jean-Michel Mermet after 12 years arduous and productive service and inspiring leadership, of Dr Christianne Sénémaud and of Prof. Max Zander, who has served

Commission V.4 aims at providing IUPAC nomenclature or notations for spectroscopic techniques as they develop.

the commission for an astonishing 16 years. The new commission membership reflects the changing emphasis of the commission's work.

Over the past decade or two, Commission V.4 has tried, and largely successfully, to provide IUPAC nomenclature for the established procedures in analytical atomic and molecular spectroscopy. It has also provided, thanks to Dr Sénémaud, a much needed IUPAC systematic notation for X-ray spectroscopy. Within a year, most of the established techniques in analytical spectroscopy will have been provided with published IUPAC nomenclature or notation recommendations.

The current and new tasks of the commission are aimed at providing IUPAC nomenclature or notations for new and emerging techniques as they develop. These include a series, 5 in all, of projects in laser-based spectroscopy. The expertise of the new chairman, Dr Tuan Vo-Dinh, in this field makes him well qualified to lead the commission's work. Two new projects initiated in Hamburg, on inorganic mass spectrometry and on photo-thermal spectroscopy, also fall into this category of rapidly developing new fields.

A project in the hands of Prof. Mermet tackles the thorny problem of providing a rational systematic framework for abbreviations and acronyms in analytical spectroscopy and the complexities of the new hybrid techniques such as HPLCICPMS or HPLC-ICP-MS or whatever makes the situation worse. The example set in this document may be helpful to other chemical disciplines.

To date, since its inception, V-4 has published nine IUPAC nomenclature or notation documents and four more will be published within one year – not a bad record for a commission threatened with disappearance into a misalliance with Commission I-5.

Dr A.M. Ure

Stability constant database near to completion

The use of the stability constant interrogation program was demonstrated on a trial database at the Hamburg meeting of the Commission on Equilibrium Data (V.6). The entry of thousands of experimental results is well advanced, and is being funded by the IUPAC Committee on Chemical Databases. A large number of volunteer researchers have contributed to the collection of these data from the literature over the period 1974–89; it is hoped that a marketable product will be available at the end of 1992.

Of the ongoing stability constant critical survey projects, four have now been completed; two (the metal-nucleotide and metal-glycine complexes) have recently been published in *PAC*, while the other two are being reviewed by commission members. The status of other critical surveys including those on complexes of other amino-acids, hydrocarboxylic acids, macrocyclic ligands and carbonates, was discussed. A new project for the survey of hydroxo complexes was organized and presented for approval at the division meeting.

A major project, consisting of six individual topics on complex equilibria between metal ions and polyelectrolytes, has been completed. It is expected that this, and a review of ionic strength corrections to stability constants will be published in 1992. Two other projects discussed and organized by the commission on the specific problems in measurements and interpretation of complexation phenomena in seawater, and on the critical evaluation of equilibria in molten salts, are of considerable interest in many fields of chemistry.

For the future, new projects on the determination and interpretation of complex formation microconstants, and the interconversion of stability constants which are based on different pH scales, were discussed in detail.

A joint meeting with the Commission on Electroanalytical Chemistry (V.5) was held and the status of our common projects on ion-selective electrode calibration techniques and voltammetric method was discussed.

The next meeting of the commission will be held in Lausanne, Switzerland during the 29th International Conference on Coordination Chemistry in July 1992.

Dennis G. Tuck and Tamas Kiss

Commission V.7 intensifies environmental activities

Prof. Darleane Hoffman resigned as chairperson of the Commission on Radiochemistry and Nuclear Techniques (V.7) at its meeting in Hamburg. The new chairman is Prof. J. P. Adloff and the new vice chairman, Prof. Y.-F. Liu.

Several commission projects have been terminated and published, namely:

- Total half-lives for selected nuclides (N. E. Holden, *PAC*, Vol. 62, No. 7, pp. 941–958, 1990);
- Isotopic and nuclear analytical techniques in biological systems (K. S. Kosprzak, *PAC*, Vol. 63, No. 9, 1269–1306, 1991);

Commission V.7 in Hamburg.

- Information on training in radiochemistry and nuclear techniques (J. P. Adloff, *PAC*, Vol. 62, No. 7, pp. 959–1002, 1990);
- Radiolabelling of monoclonal antibodies with metal chelates (J.-F. Liu and Wu Chuanchu, *PAC*, Vol. 63, No. 3, pp. 427–463, 1991).

In addition, several papers are presently being reviewed by the Division Committee and by members of Commission V.7. Among them it is certainly worthwhile mentioning a very extensive compilation on nomenclature for isotope, nuclear and radioanalytical chemistry by P. Karol. This glossary comprises more than 1000 entries. Of these items, just over 100 appear (as definitions or cross references to definitions) in all previous sources.

Several other projects have been initiated or are in an advanced state. Considerable progress has been made in a study (by H. A. Das, J. P. Adloff, P. Benes, H. R. von Gunten and E. Steinnes) of speciation in the environment by nuclear techniques. This study deals with chemistry at ultra-low concentrations, the speciation of radionuclides in the environment, nuclear methods for an assessment of speciation and the use of radiotracers in speciation work.

A paper by R. J. Ch. Hagemann, presently under review by the Division Committee, is about the migration of actinides in groundwater. A proposed new contribution by E. Roth will describe, among other topics, applications of stable isotopes to environmental problems. A further contribution (by H. A. Das) to environmental problems will treat the release of ^{137}Cs from aquatic sediments. Thus, at present, environmental topics are developing into an important activity of Commission V.7.

The commission is further exploring, together with Prof. V. A. Koptyug, possible cooperation with the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) and eventually with IUR (International Union of Radioecologists). Topics considered for such cooperation include migration of radionuclides in the environment. The commission also held a very interesting joint meeting with the Limited Lifetime Commission on Environmental Analytical Chemistry. Common interest and possible cooperation between the two commissions were explored.

The next meeting of Commission V.7 will be held in Vienna, Austria, on 6 September 1992, prior to the 3rd International Conference on Radiochemistry and Nuclear Chemistry.

Prof. H. R. von Guten

Chromatography and other analytical separations

Three titular members, two associate members and three national representatives were present at the Hamburg meeting of the Limited Time Commission on Chromatography and Other Analytical Separations.

Hamburg: LLTC on Chromatography and Other Analytical Separations.

This LLTC started in Lund in 1989 for an initial period of 4 years. The Commission agreed that, with their proposed projects, it should continue after the Lisbon General Assembly in 1993.

Chairman Prof. Peter Uden represented the LLTC on the Steering Committee on Nomenclature but in the future Dr Skip Kingston will be the representative. The LLTC was extremely concerned about the proposals of the IUPAC Officers to amalgamate core commissions of the Analytical Chemistry Division.

Of the projects originating from the former Commissions V.1 and V.3, the report on chromatography nomenclature prepared by Dr Lesley Ettre is now ready for public review. Lesley will be asked to write a 200-word abstract and to handle the comments before publication in *PAC*.

Prof. Frans Everaerts was asked to confine his nomenclature proposal on electrophoresis to terms relating to the newly developing methods of capillary electrophoresis. A former Commission V.3 project on liquid–liquid extraction will be finalized by our former member Dr Mike Leonard and sent to the Division Secretary.

We feel very proud that, after only 2 years of existence, we will be able to send two projects to the Division by the end of this year:

- Nomenclature of supercritical fluid chromatography and extraction (Roger Smith);
- Nomenclature of analytical pyrolysis (Peter Uden).

Another seven projects were considered for initiation in 1991. We were pleased to receive a positive assessment of our Commission by Division representative Prof. R. Kalvoda.

Our next meeting will be held at Veszprem, Hungary in 1992. By that time my period as a IUPAC member will be complete and Roger Smith will be the new Secretary.

Prof. Carel Cramers

Environmental contaminants in foods

The Commission on Food Chemistry (VI.1) continues to place a high priority on activities designated to identify the incidence and significance of environmental contaminants (e.g. industrial and chemical conta-

minants, mycotoxins, and aquatic biotoxins) in food supplies. These effects include the conduct of international inter-laboratory validation studies of methods designed to detect and quantify these contaminants.

Additionally, completed projects have identified national regulatory programmes world-wide which focus on limiting human exposure to these toxicants. Project publications recently available in the area of mycotoxins include as topics: an international mycotoxin check sample programme; national and international regulations and rationales for establishment of such regulations as well as several ELISA, affinity column immunochemical method validation studies for aflatoxins.

For industrial contaminants, publications cover the areas of ethyl carbamate (urethane) in alcoholic beverages and foods, and gas-chromatographic separation of dibenzo-*p*-dioxins and dibenzo-furans.

A publication outlining the regulations and rationales used in establishing such regulations for aquatic biotoxins will be available shortly. Finally, Commission VI.1 continues to concentrate its efforts on the interlaboratory validation of immunochemical methods, (for example, ciguatoxin in fish, aflatoxin in corn and peanuts), which can be used in monitoring environmental contaminants as well as the establishment of criteria for the evaluation, validation and quality control of ELISA, affinity column and RIA-based residue analytical methods.

The next meeting of Commission VI.1 will be held in Mexico City, Mexico, on 4–6 November 1992, in conjunction with the 8th IUPAC Symposium on Mycotoxins and Phycotoxins on 8–12 November 1992.

Dr Douglas L. Park

The Commission on Food Chemistry places a high priority on the identification and management of environmental contaminants in foods.
(*WHO Photo by E. Schwab.*)

Oils, fats and derivatives

At its meeting in Hamburg on 8–10 August 1991, the Commission on Oils, Fats and Derivatives (VI.3) reviewed commission projects and existing methods in respect of environmental requirements.

A search will be carried out for a screening method to fix the conditions for the determination of *trans-trans* isomers of fatty acids by capillary gas chromatography. This work will be coordinated by Dr Albrecht Dieffenbacher — the commission's new chairman.

Work on the detection of cross-contamination of edible oils transported in bulk will continue in the next period. The coordinator Marshall Pike will publish a review of the results up till now with the tentative method (gas chromatography–mass spectrometry). Work on another project dealing with an environmental problem: determination of residual chlorinated hydrocarbons will continue applying a distillation method. The working group will be coordinated by Dr Gerd Ostermann who replaces Dr Allain Karleskind.

An *ad-hoc* group (coordinator Ir Patric Dysseler, the new vice-chairman) is studying methods for the determination of cadmium in edible oils. Following discussions on the environmental aspects of analytical methods, Dr Gerhard Zwerenz presented results of a questionnaire concering the impact of some 20 chemicals on workers, water, air and oil. Zwerenz will publish a paper giving the results obtained until now as a preliminary report.

A joint group with DGF with Dr Gerd Ostermann as coordinator will continue to study methods for the detection of thermally treated oils. Prof. Herbert Wessels has produced a joint paper in cooperation with Dr Rosenthal of the Food Chemistry Commission on the assessment of lipid oxidation. The work will continue on an *ad-hoc* basis with the search for an analytical approach to the oxidation of oils and fats. A working group, coordinated by Prof. Jan Pokorny will carry out a new collaborative study on the determination of chlorophyll using a spectrophotometric method and an improved HPLC method. Dr Joyce Beare-Rogers reported progress with the study of the nomenclature of fatty acids which is carried out in cooperation with IUNS.

The 1st supplement to the 7th edition of *Standard Methods on Oils, Fats and Derivatives* will contain not less than 23 new methods and some revised methods in which toxic reagents or solvents have been replaced. A new working group coordinated by Dr Karsten Stig-Andersen will study a rapid method for the determination of the unsaponifiable matter in oils and fats. Another new working group coordinated by Dr Gerhard Zwerenz will review the existing standard method for oils, fats and derivatives to meet environmental requirements by replacement of classical methods using toxic solvents/reagents, reduction of sample size and replacement of toxic/carcinogenic solvents/reagents in general.

The next commission meeting will be held in Budapest, Hungary on 9–11 September 1992.

Dr Pim Hendrikse

Periods of office

Starting with effect from the 37th IUPAC General Assembly to be held in Lisbon, Portugal in August 1993, all periods of office of members of IUPAC committees and commissions will begin on 1st January of the year following the General Assembly and end on 31st December of the year in which the period of office is due to terminate. This will consequently affect many who had expected to end their service in 1993 at the end of the Lisbon General Assembly. They will now serve as members until 31 December 1993.

Atmospheric chemistry

The Commission on Atmospheric Chemistry (VI.4) met in Hamburg on 9–10 August 1991 and elected Sjaak Slanina as the new chairman. He succeeds Jack Calvert who has served the commission since 1985 and has been responsible to a large extent for its present level of functioning.

The review of analytical methods for the measurement of contaminants in the workplace is nearing completion. This is a survey of procedures used world-wide and covers many substances. The evaluation and recommendation of units for use in atmospheric chemistry also is reaching the final stage of preparation. The document is to stimulate the atmospheric-sciences community towards adopting a common set of units inspite of difficulties still remaining.

Several other projects have not proceeded as well as expected. For example, the preparation of a compendium of agencies, institutions and ongoing activities in atmospheric chemistry, intended to provide guidance to other scientists, has failed to draw the necessary response from addressees and needs a second round of inquiry. A world-wide inventory of pollutant emissions also is lagged behind schedule because data acquisition in several countries has run into difficulties.

The second round of an inventory of current tropospheric sampling networks, dealing with standardization, requires cooperation with the International Organization for Standardization (ISO). Appropriate contacts have been made. Work on regulations for emissions and standards on ambient and work-place atmospheres had to be discontinued in order to avoid duplication of a closely related project started by ISO.

A number of other problems will have to be pursued jointly with other commissions. Interaction with the Commission on Water Chemistry has resulted in two new feasibility studies on the deposition of species from air into groundwater and on the fate of products from the breakdown of alternative fluorocarbons in the atmosphere. A joint session with the Commission on Chemical Kinetics has identified a real need for the evaluation of kinetic data in atmospheric heterogeneous chemistry and this will be an important project in the future. Finally, the evaluation and compilation of Henry's law coefficients related to atmospheric chemistry has lagged because of other priorities and closer cooperation with the subcommittee on gas solubilities will be sought.

A number of articles on local environmental problems has been prepared under the subject editorship of Prof. X. Tang and will soon be submitted for publication in *Chemistry International*. Other activities of the commission relate to education in the field of atmospheric chemistry, particularly seeking ways and means of training young scientists from Third World countries in the field.

The Commission was very pleased with the success of the Workshop on the Assessment of Uncertainties in the Project Concentrations of CO_2, organized by IUPAC and ECN (Energieonderzoek Centrum Nederland) on 3–6 July 1990, at ECN (see pages 10–14 of January 1991 issues of *CI*) and decided that a similar workshop, on the assessment of uncertainties in the project concentrations of methane, should be organized in Moscow.

The Commission discussed and finalized its participation in the World Conference on Chemistry of the Atmosphere: Its Impact on Global Change (CHEMRAWN VII) in Baltimore, December 1991.

Peter Warneck

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairpersons and secretaries and IUPAC officers were published in the November 1991 issue of *CI* (Vol. 13, No. 6, pp. 223–233). The IUPAC Secretariat has been notified recently of the following appointments, additions and changes:

Prof. P. De Bièvre (Chief Coordinator, Limited Life Time Commission on Isotope Specific Measurements as References). Central Bureau for Nuclear Measurements, Commission of the European Communities, Steenweg haar Retie, B-2440 Geel, Belgium.

Prof. J. G. Topliss (President, Section on Medicinal Chemistry). The University of Michigan, College of Pharmacy, Department of Medicinal Chemistry, 428 Church St., Ann Arbor, MI 48109-1065. Tel: +1 (313) 764 6130. Fax: +1 (313) 763 2022.

Dr Klára Tóth (Commission on Electroanalytical Chemistry). Általános es Analitikai, Kémiai Tanszék, Budapesti Müszaki Egyetem, Gellért tér 4, H-1111 Budapest, Hungary. Tel: +36 (1) 664 011, Ext. 2273. Telex: 225931 MUEGY H. Fax: +36 (1) 1853 493.

Prof. J. M. Ward (Treasurer). Fax: +44 (986) 894502.

Dr B. Vincent (Secretary, Commission on Colloid and Surface Chemistry including Catalysis). Tel: 0272 288160.

Information for affiliates

IUPAC Publications

Affiliates are entitled to a 25% reduction on the cost of all IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications together with an order form may be obtained from the IUPAC Secretariat.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available free of charge to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC programme on chemistry and the environment* have been distributed to members of IUPAC commissions and committees, national adhering organizations and other bodies associated with IUAPC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Secretary.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2–3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK

Tel: +44 (865) 747744
Fax: +44 (965) 747510
Telex: 83147 VIA OR G
attn. IUPAC

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon or navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 88 of the July 1990 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC commissions. A full list of names and addresses of all commission officers for 1991–93 was published on pages 223–233 of the November 1991 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually – but not always – announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.

Conferences

Ring-opening polymerization
Warsaw, Poland
7–11 July 1992

IUPAC SPONSORED

A IUPAC sponsored Symposium on Ring-opening Polymerization will be held in Warsaw, Poland, on 7–11 July 1992. The aim of the symposium is to bring together scientists working in the area of polymerization of heterocycles and related processes.

The symposium will focus on the synthesis, characterization and properties of polymers obtained *via* ring-opening polymerization. Special emphasis will be given to novel synthetic methods, new initiator systems, modelling and design of polymers with well defined molecular structures. The applications of non-traditional materials obtained *via* ring-opening polymerization will also be included.

The scientific programme will consist of plenary and invited lectures, oral and poster communications, divided into four sections:

1. Cationic ring-opening polymerization.
2. Anionic ring-opening polymerization.
3. Coordination ring-opening polymerization.
4. Novel engineering and biomedical polymers *via* ring-opening polymerization.

The symposium language will be English.

Warsaw is the capital of Poland. It has a variety of museums, concert halls, opera, shopping centres and the old town. Excursions are planned to the ancient capital, Cracow, Copernicus' city Toruń and the Old Hansa city Gdańsk, cradle of the Solidarity Movement.

Solubility phenomena
Moscow, Russia
8–10 July 1992

IUPAC SPONSORED

The 5th International Symposium on Solubility Phenomena (5th ISSP) will be held in Moscow in the N. S. Kurnakov Institute of General and Inorganic Chemistry of the Russian Academy of Sciences.

The symposium will be concerned with many aspects of solubility. There will be plenary lectures by internationally known experts and a large number of submitted papers for either oral delivery or poster presentation.

Subject matter will include:

- new solubility data (in aqueous, non-aqueous and mixed solvents);
- theory of phase equilibria and phase diagrams;
- correlations and predictions of solubility data;
- solubility phenomena in molten salts, glasses, metals, polymer and hydrothermal systems;
- solubility of electrolytes, non-electrolytes and gases;
- calorimetry and complex solution chemistry;
- pollutant solubilities and environmental chemistry;
- applications of solubility data in chemical power engineering.

The official language of the conference will be English. No simultaneous translation will be provided.

Academy of Sciences hotel accommodation is available at USD 60 per night, single and USD 90 per night double occupancy as well as at Intourist top and second category hotels at USD 175–250 per night.

In July, the weather in Moscow is normally dry and warm. The average daily temperature at this time of the year is 18–22°C. Moscow can be reached by air from practically any part of the world. Most European and many Asian countries have railway connections with Moscow. All foreign conference participants arriving at Moscow airport or railway stations will be met by representatives of the Local Organizing Committee.

Risk management of chemicals – can chemicals be used safely?
Surrey, UK
13–16 July 1992

IUPAC SPONSORED

An International Symposium on Risk Management of Chemicals – Can Chemicals Be Used Sagfely? will be held at the University of Surrey, Guildford, UK, on 13–16 July 1992. The symposium is being organized by the Royal Society of Chemistry (RSC) and sponsored by IUPAC, European Community, Federation of European Chemical Societies (FECS), the United Nations Environment Programme (UNEP) and the World Health Organization (WHO).

The symposium is a sequel to the RSC's previous conferences on Toxic Hazard Assessment of Chemicals' in 1986 and 'Risk Assessment of Chemicals in the Environment' in 1988.

The Surrey symposium will focus on practical application and implementation of risk assessement to meet specified goals and achieve safe use of a substance. (*Photo Hoechst AG/Walter Kloos.*)

The symposium will be held in Guildford which is an attractive and historic town, providing an excellent centre from which to explore some of the finest country houses and gardens in England, as well as the spectacular scenery of the Downs and Weald. The temperature in England in July can range from 15 to 30°C but rain is possible.

The aim of the conference is to focus on the practical application and implementation of risk assessment to meet specified goals and achieve safe use of a substance. It includes the managerial, decision-making and active hazard-control processes to deal with those harmful agents for which risk evaluation has indicated that the risk is too high. It is thus a combination of three steps: risk indication, emission and exposure control and risk monitoring.

On registration, delegates will receive a copy of the proceedings of the conference. The official language of the conference will be English.

The social programme will include an informal buffet on Sunday evening, a mixer reception on Monday and the Conference Dinner at Clandon Park on Wednesday.

The conference will be preceded by a teach-in on Sunday 12 July. This teach-in will enable the less expert delegate to learn some of the fundamentals concerning the interdisciplinary nature of risk management, the terms repeatedly used and the means of retrieving data.

The scientific programme will consist of 6 sessions:

1. Setting the scene;
2. Managing risks in manufacturing – Part 1;
3. Managing risks in manufacturing – Part 2;
4. Managing risks from waste;
5. Manging risks during chemical use;
6. The social dimension of risk management.

In addition, there will be a poster session, for which late offers are still being accepted. A 100-word synopsis and title should be submitted to Dr Gibson at the address shown in the Conference Calendar.

Fees for the teach-in only are GBP 117.50 for RSC members and GBP 152.75 for non-members. The fees for the symposium itself including the cost of a copy of the proceedings are: GBP 141.00 (RSC and FECS members); GBP 211.50 (non-members); GBP 58.75 (students/retired persons); GBP 11.00 accompanying persons. Fees for attending both teach-in and symposium are: GBP 258.50 (RSC members); GBP 364.25 (non-members). IUPAC affiliates are entitled to a 10% discount on the above fees.

Macromolecules
Prague, Czechoslovakia
13–18 July 1992

IUPAC SPONSORED

The 34th IUPAC International Symposium on Macromolecules will be held at the Palace of Culture, Prague, Czechoslovakia, on 13–18 July 1992.

Palace of Culture, Prague.

The scientific programme of the symposium will consist of nine sections. In addition to a general section and two microsymposia dealing with the synthesis, structure, properties, and applications of polymers, the symposium will include six microsymposia covering basic research and the practical applications of polymers. The following are the themes of the microsymposia:

- polymerization chemistry
- structure and properties of polymers;
- polymers in pharmaceuticals;
- electrically and optically active organic solids
- polymer blends and composites;
- polymer sorbents, catalysts, reagents, and separation media;
- polymer membranes;
- degradation and stabilization of polymeric materials.

The general section will be devoted to new concepts in the synthesis, characterization, properties, and applications of polymers or polymer systems not included in the topics of the microsymposia.

Speakers have been invited to present 10 plenary lectures (two of them at the opening session), 72 main lectures, and 88 special lectures. Contributions covering unpublished results relating to the symposium programme can be presented as posters. Two poster sessions for each microsymposium and four poster sessions for the general section are scheduled in the scientific programme.

The symposium programme will also feature an IUPAC Forum and a plenary session for reporting the activities of IUPAC and its Macromolecular Division.

The symposium language will be English. No translation facilities will be provided.

The registration fees are CHF 600 for participants(CHF 240 for students) with a 10% reduction for IUPAC affiliate members. Fees, equivalent to the above amounts in Swiss Francs (CHF), may be paid in any convertible currency or Czechoslovak crowns.

Accommodation will be available in both hotels and student halls of residence. The weather in Prague in July is generally pleasant with daily temperatures of 15–20°C but heavy showers may occur. Local points of interest include Prague Castle, The Charles Bridge, St Nicolas Church, The National Theatre, The National Museum and Wenceslas Square.

Chemistry, agriculture and the environment
Guildford, Surrey, UK
16–18 July 1992

IUPAC SPONSORED

An IUPAC-sponsored International Conference on Chemistry, Agriculture and the Environment will be held at the University of Surrey, Guildford, UK, on 16–18 July 1992.

The conference aims to provide a forum for agrochemical producers, risk assessment professionals, regulators and academics, and all those with an interest in the safe and effective use of agrochemicals. The conference will bring together a number of authorities in various aspects of chemistry, agriculture and the environment.

The scientific programme will contain single-stream oral lectures plus poster sessions. All lectures, posters and accommodation is on campus. Every effort will be made to facilitate informal contact.

The invited lectures include:

- Immunological analysis of pesticides (G. W. Aherne, Guildford, UK).
- Human health aspects of nitrate intake from water (O. Bockman and T. Granli, Norway).
- Nitrogen losses from grassland systems under temperate climatic conditions (M. G. Garrett, Belfast).
- Behaviour of organic agrochemicals in irrigated soils (Z. Gerstl, Israel).
- Contamination of surface waters, sediment and biota by a pesticide producing plant in Berlin (E. Heinisch, Germany).
- Methane and ammonia in the atmosphere: impact of grassland agriculture (S. C. Jarvis, UK).
- Information sources for chemistry, agriculture and the environment (H. Kidd, UK).
- Pesticides, environmental pollution and human health (S. Li, China).
- Toxicology and risk assessment of pesticides (M. Manno, Italy).
- Health advisories for pesticides (J. Orme, USA).
- Impacts of agriculture on wild plants and animals in the UK: chemical impacts in perspective (D. Osborne, UK).
- Pesticides in water – Human health, agriculture and environmental aspects (T. R. Roberts, UK).
- Operator exposure to agrochemical sprays (D. Stevenson, UK).
- Agricultural waste (M. Malcolm, UK).

The conference language will be English.

The registration fees are GBP 180 for members of European Chemical Societies and IUPAC affiliate members; GBP 230 for non-members and GBP 100 for student members. Accommodation is available in university student residences. Rooms with en-suite toilet and shower are available at extra cost.

The climate in the UK is temperate. In July, the weather is normally sunny and warm with a temperature of 18–25°C, but rain is also possible.

The University of Surrey lies on the A3 London to Portsmouth road and is less than 800 m from Guildford Station. The town centre is an easy walk away. Guildford is close to both London Heathrow and Gatwick airports. Both can be reached by public transport in about 45 minutes.

Guildford is an attractive old market town with an historic cobbled High Street and twelfth-century castle. There is a wide range of interesting shops, a museum, art gallery and theatre. Guildford forms a convenient base for exploring the rest of Surrey and Southern England, with rapid road and rail links to the South Coast, and London (30 minutes by rail) with all its attractions.

Novel aromatic compounds
Victoria, British Columbia, Canada
19–24 July 1992

IUPAC SPONSORED

The 7th International Symposium on Novel Aromatic Compounds (ISNA-7) will be held in The Victoria Conference Centre, adjacent to the Empress Hotel right in the heart of downtown Victoria, facing Victoria Harbour.

The symposium will be concerned with the synthesis, structure and properties of novel compounds and materials containing conjugated ring systems. The electronic properties, spectroscopic properties and chemical reactivity of novel benzenoid and non-benzenoid molecules are all of interest. Special emphasis will be given to new materials with unusual properites.

ISNA-7 will give participants an opportunity to mingle with world leaders in aromatic chemistry, including such areas as "Buckeyballs", molecular recognition by cyclophanes, organomagnets, and twisted and tormented molecules of all types.

The scientific program will include 24 invited lectures and three two-hour poster sessions, with posters being available for the entire first three days of the conference. There is ample poster space for all attendees, but attendance at the symposium is limited to 400 delegates.

Victoria Harbour: ISNA-7 will take place in The Victoria Conference Centre, adjacent to the Empress Hotel (building with flagpole).

The invited lecturers are: A. Balaban (Romania), F. Diederich (USA), R. Haddon (USA), K. Hafner (Germany), H. Hart (USA), P. C. Hiberty (France), H. Hopf (Germany), H. Iwamura (Japan), M. Jones, Jr. (USA), K. Komatsu (Japan), Y. H. Lai (Singapore), K. Mullen (Germany), I. Murata (Japan), R. A. Pascal Jr (USA), M. Rabinovitz (Israel), R. E. Smalley (USA), H. Staab (Germany), J. F. Stoddard (UK), K. Takahashi (Japan), R. Taylor (UK), N. Tyutylkov (Bulgaria), E. Vogel (Germany), K. P. C. Vollhardt (USA) and K. Yamamoto (Japan).

The official language of the symposium will be English. Translation facilities will not be available. IUPAC affiliate members will be offered a discount on fees, and there will be a reduced registration fee for students.

Victoria is a major tourist centre in the summer, with over 2 million visitors per year. There are therefore several thousand hotel rooms. Nevertheless, during July, these are normally almost full, so advance booking is essential. Inexpensive accommodation will be available at the University of Victoria Student Residences, about 8 km away (15 minutes by a good bus service).

Because Victoria is situated on Vancouver Island, about 30 km off the West Coast of Canada, and is in the rain shadow of the Olympic Mountains of the USA, the climate is extremely variable – it can range from 15 to 30°C, and can either be dry or wet. It is, however, a beautiful city, being surrounded by mountains on either side of the straights. It is thus not exposed to the open Pacific Ocean. However, Vancouver Island, which is about 450 km long, soon becomes extremely rugged rain forests, mountains, lakes and forests. The West Coast, open to the Pacific, is difficult to access, except at Pacific Rim National Park. Salmon fishing is excellent in July.

Coordination chemistry
Lausanne, Switzerland
19–24 July 1992

IUPAC SPONSORED

The 29th International Conference on Coordination Chemistry (29th ICCC) will be held on the campus of the University of Lausanne.

1992 marks the 100th anniversary of the submission of Alfred Werner's classical paper on the theory of coordination compounds and so it is appropriate that the ICCC is being held in Switzerland this year. Although all Werner's work on coordination compounds was carried out in Switzerland, his early life was spent in Alsace. The conference organizers have therefore invited another distinguished Alsatian coordination chemist, Prof. Jean-Marie Lehn, to give a commemorative lecture. The 100th anniversary of coordination chemistry will also be marked at the conference by the inclusion of short talks by some of the most distinguished coordination chemists of the past 40 years.

The following scientists have agreed to present plenary lectures: J. D. Corbett (USA); F. A. Cotton (USA); A. Schanzer (Israel); A. Shilov (USSR); K. Wieghardt (Germany). There will be 7 microsymposia on the following themes:

- Theoretical aids to molecular design.
- Molecular design – experimental aspects.
- Determination of reaction pathways.
- Catalytic pathways.
- Synthesis of extended systems
- Coordination chemistry of surfaces.
- Supramolecular coordination chemistry.

Additional microsymposia may also be organized in response to submitted abstracts.

The following subjects have been chosen for session lectures: f-block elements; Industrial applications of coordination chemistry; Photochemistry; The M–O functionality; Molten salts and non-aqueous solvents; Organometallic derivatives of coordination compounds; Organic synthesis via coordination compounds; Long range electron transfer; Molecular magnets and devices; Electronic spectra and theory; Coordination structure and equilibria; Cluster chemistry; Reaction mechanisms; Bioinorganic coordination chemistry.

Posters on any aspect of coordination chemistry may be contributed by participants. They will be classified either under the heading of one of the microsymposia or sessions, or under one of the following 6 general headings:

1. Synthesis.
2. Kinetics, thermodynamics and reaction mechanisms.
3. Applied and analytical coordination chemistry.
4. Structure, bonding and spectroscopy.
5. Bioinorganic chemistry.
6. Catalysis and organometallics.

The conference language will be English.

The registration fees (before/after 92.05.01) are CHF 600/750 for full participants; CHF 400/500 for young scientists and CHF 70/70 for accompanying persons. IUPAC affiliates are entitled to a 10% reduction in the registration fees. The registration fees for participants and young scientists cover admission to all scientific events, complimentary social events, light refreshments during the scientific sessions, and the conference programme and book of abstracts.

Hotel accommodation will be handled by the Lausanne Tourist Office. Details are in the conference 1st circular.

Lausanne, capital of the French speaking Canton of Vaud, is situated on the north shore of Lac Léman, one of the largest lakes in Western Europen. Geneva lies 60 km to the southwest, the Jura mountains to the north, and the Swiss Alps approximately one hour's drive away to the east. The countryside around Lausanne is attractive, with vineyards sloping down to the lake.

The city of Lausanne has Roman origins and was an important town in the Middle Ages when the magnificent Gothic cathedral was built. It has remained an important international city, and is the seat of the International Olympic Committee. The University of Lausanne was founded in 1537, and its campus at Dorigny is situated roughly 10 km from the centre of the city. Lausanne is readily accessible by road and is well served by international railway connections. The near airpower is Geneva (60 km, a frequent train service operates between the airport and Lausanne). Zürich airport is a 3 hour train journey away.

The weather in Lausanne in July is normally warm and sunny, with an average temperature around 25°C. The evenings can be comparatively cool, and occasional rainy days are possible.

Photochemistry
Leuven, Belgium
19–25 July 1992

IUPAC SPONSORED

The 14th IUPAC Symposium on Photochemistry will be held at the University of Leuven, Belgium, from Sunday 19 to Saturday 25 July 1992. The registration fees are BEF 15 000 for active participants, BEF 8000 for students and BEF 5000 for accompanying persons. IUPAC affiliates are entitled to a 10% reduction in the fee.

The scientific session, which will be held in the centre of town in the new spacious *Aual De Somer* of the university, will start on Monday morning and run until Friday. Twenty-two invited lectures to be held in plenary sessions will cover topics of current interest in photochemical science. There will also be poster presentations and short communications organized in parallel sessions.

The following are the titles of the plenary lectures:

- Micro- and nanosecond detection of biological dynamics by polarized luminescence;
- Ultra-fast experiments on the role of vibrational modes in electron transfer;
- Some new developments in radiation curing;
- Tunable photoresponsive supramolecular systems;
- Optimized photoinitiators for radical curing;
- The photoregeneration of acids and bases within reactive polymer coatings;
- Approaches to polymer curing and imaging;
- Photochemistry in the interstellar matter;
- Bioinorganic photochemistry;
- Photochemical and photophysical aspects of silver halide image recording systems; Synthetic and mechanistic aspects of styrene-amine addition reactions;
- Microphotoconversion: integrated photochemical processes on modified and fabricated surfaces;
- From femtoseconds to biology;
- Mechanism of phototransduction in rhodopsins;
- Photocatalytic oxidation of organic contaminants in water: an aid to environmental preservation;
- Solid-state photochemistry;
- Photochemistry and spectroscopy of substituted polysilane derivatives;
- Chemical amplification in photopolymers;
- Photochemistry of highly organized biomolecules sequence selective photoreaction of DNA;
- Chemiluminescence in the liquid-phase oxidation of hydrocarbons: the mechanistic aspects and applications;
- Photochemistry and photophysics of coordination compounds of the main group metals;
- Ultra-fast and photo-induced electron transfer reactions in supramolecular arrays;
- From supramolecular photochemistry of the molecular computer;
- Triplet 1,4-biradical intermediates in the photocycloaddition reactions of enones and *N*-aylindoles.

A social gathering welcoming the participants will be organized on the Sunday evening. During the afternoon and evening of Wednesday an excursion to the city of Antwerp, including a dinner cruise in the harbour will take place. The final event of the symposium will be a banquet on Friday.

Leuven is situated 20 km east of Brussels in the centre of Europe and can easily be reached by rail from anywhere in Europe as well as from the international airport of Brussels. It is a typical lively university town, seat of a centre of learning founded in 1425 and as such one of the oldest in Europe.

Rooms have been reserved in a number of hotels in Leuven as well as in university halls of residence.

Exploration, mining, and processing of materials
Randburg, Transvaal, South Africa
2–7 August 1992

IUPAC SPONSORED

The IUPAC-sponsored 3rd International Symposium on Analytical Chemistry in the Exploration, Mining, and Processing of Materials will be held at the Sandton Sun Hotel, Sandton, South Africa, on 2–7 August 1992.

Analytical chemistry is of vital importance to the mining and mineral industry. It is used not only in the exploration and exploitation of mineral deposits, but also in the processing of materials. The aim of this symposium is to highlight the importance of analytical chemistry in the production of materials, from the initial stages of exploration and assessment of ores to their beneficiation and finally, to the refined product.

The technical programme will comprise plenary lectures, parallel sessions of oral presentations, and poster presentation. The general theme will be the role

Tapping the 200-kW plasma furnace at Mintek (Council for Mineral Technology in South Africa). Amongst its many activities, Mintek has an active Pyrometallurgical R & D Division. The photograph shows a small furnace for testwork. The Secretariat of the 3rd International Symposium on Analytical Chemistry in the Exploration, Mining, and Processing of Materials is located at Mintek.

of contemporary chemical analysis in mining and industrial technology. The following topics will be covered:

- geochemical exploration;
- extraction and beneficiation of materials;
- value-added products;
- environmental aspects;
- coal;
- metals and alloys;
- rare earths;
- noble and base metals;
- analytical assurance and laboratory management;
- automation and process control;
- high-technology materials.

The official language of the symposium will be English. No translation facilities will be available. Modern scientific instruments and books will be on display throughout the symposium.

August is a winter month in South Africa, with mild, sunny days and cool to cold evenings. The average night and day temperatures are 5–18°C.

Chairman of the Symposium Organic Committee is Dr Vic Schüler. IUPAC affiliate Ron Mallett is Vice-Chairman and another IUPAC affiliate, Prof. C. J. Rademeyer is Chairman of the technical programme.

Biotechnology
Crystal City, Virginia, USA
16–21 August 1992

IUPAC SPONSORED

The 9th International Symposium on Biotechnology will be held in Crystal City, Virginia overlooking Washington, DC from the Virginia side of the Potomac River.

The symposium will be hosted by the American Chemical Society's Division of Biochemical Technology and sponsored by IUPAC, the American Institute for Chemical Engineers, the American Society for Microbiology, and the Society for Industrial Microbiology. Oral presentations will be held at the Marriott Crystal City. Poster sessions as well as an exposition will be held at the Hyatt Regency Crystal City.

The symposium will address various areas of research and development in biotechnology including molecular biology, microbiology, bioprocess engineering and public policies in biotechnology.

The scientific programme will include invited lectures and poster sessions of contributed papers in the areas of frontiers in polypeptide production, frontiers in the production of metabolites, microbiology and physiology, biocatalysis and biotransformation, bioreactor engineering, downstream processing, bioinstrumentation and bioprocess control, policy issues in biotechnology, environmental biology and engineering, agriculture and food biotechnology and biotechnology in developing countries.

The official language of the symposium will be English. Translation facilities will not be available.

Members of sponsoring societies will be offered a discount on the registration fee. A reduced registration fee will also be offered to full-time students presenting proper supporting documentation.

Sleeping rooms will be available at the Marriott Crystal City, the Hyatt Regency Crystal City as well as several other hotels within walking distance. A shuttle service to and from the various will be provided.

The symposium will be held in the middle of the summer. Hot, dry conditions can be expected with typical temperatures ranging from 30 to 35°C.

To ensure receipt of the symposium announcement which will include the technical programme, accommodation and registration information, please send your name and mailing address to the Symposium Headquarters c/o American Chemical Society at the address listed in the Conference Calendar.

Chemical thermodynamics
Snowbird, Utah, USA
16–21 August 1992

IUPAC SPONSORED

The 12th IUPAC Conference on Chemical Thermodynamics will take place at Snowbird, Utah from 16–21 August 1992. The conference sessions will be held in the Conference Center at the Cliff Lodge – a large resort hotel and conference at Snowbird.

Snowbird is a popular ski resort in Winter and a beautiful summer resort that lends itself to a wide range of activities. The resort is located in Little Cottonwood Canyon of the Wasatch Mountains about 48 km south-east of Salt Lake City and Salt Lake International Airport. The summer climate at Snowbird is characterized by clear days with temperatures of 20–25°C and nights with cool temperatures dropping

IUPAC affiliate Bob Alberty at the General Assembly in Hamburg, August 1991.

to 6–15°C. Occasional afternoon thunderstorms are not uncommon.

The complete registration fee, including all meals, is USD 360 (USD 210 for students) or USD 220 without meals (USD 100 for students). A 10% discount is available in each category for *bona fide* IUPAC affiliates. Accompanying persons will be able to register for USD 125 including breakfasts and evening meals.

The scientific programme of the conference will include plenary and award lectures (40 minutes), invited lectures (30 minutes), oral (20 minutes) and poster presentations. The official language of the conference is English. The symposium topics are as follows:

- Thermodynamics and biochemical, biological and macromolecular systems.
- Thermodynamics of electrolyte solutions.
- Thermodynamics properties of fluid phases in equilibrium.
- Thermodynamics of macrocyle systems.
- New methods and instrumentation.
- Thermodynamics of non-electrolyte mixtures.
- 8th International Symposium on Thermodynamics of Nuclear Materials.
- Thermodynamics of the solid state.
- Thermodynamics of surfaces and colloids.
- General thermodynamics.

The lecturers include IUPAC affiliate Prof. Bob Alberty (MIT, USA) who will speak on "The fundamental equation of thermodynamics for systems of biochemical reactions." Alberty is President of the IUPAC Physical Chemistry Division.

Flame structure
Novosibirsk, Russia
18–22 August 1992

IUPAC SPONSORED

The 4th International Seminar on Flame Structure (IV-ISFS) will be held in Novosibirsk, Russia, on 18–22 August 1992. The organizers are the Institute of Chemical Kinetics and Combustion and the Institute of Theoretical and Applied Mechanics of the Russian Academy of Sciences, Siberian Division. The seminar is sponsored by IUPAC and the Chemical Institute.

The seminar will focus on the chemical and physical structure of different types of flame with significance in both chemical engineering and power technology. The kinetics of dangerous and toxic substance formation in flames will also be included in the discussions.

The seminar will consist of invited lectures, oral presentations, poster sessions and 'round-table' discussions. The main fields of interest are:

- mechanisms of stationary flames spreading in gas, condensed and heterogeneous systems;
- kinetics of chemical reactions in flames;
- transient behaviour of flames under various external conditions;
- ecological problems of combustion.

Invited lectures will be presented by: Prof. Derek Bradley (Leeds, UK); Prof. M. Branch (Boulder, USA); Prof. T. Hirano (Tokyo, Japan); Prof. K. K. Kuo (University Park, USA); Prof. P. D. Ronney (Princeton, USA); Dr H. Singh (Pune, India); Prof. J. Warnatz (Stuttgart, Germany).

The official language of the seminar will be English. Translation facilities will not be available.

The registration fee for IV-ISFS will be USD 150 for participants and USD 75 for students and accompanying persons. IUPAC affiliates are entitled to a 10% reduction. The fee includes conference attendance, a book of abstracts, welcome reception and refreshments in the seminar breaks.

The seminar sessions will be held in the House of Scientists of the Novosibirsk Akademgorodok. Accommodation will be available in the 3-star "Gold Valley" Hotel. This is 5 minutes' walk from the House of Scientists.

August in Novosibirsk usually brings warm summer days with an average daytime temperature of around 20°C.

Natural products
Strasbourg, France
30 August–4 September 1992

IUPAC SPONSORED

The 18th International Symposium on the Chemistry of Natural Products will take place at the Palais des Congrès, Strasbourg, France, from 30 August to 4 September 1992. The symposium is being sponsored by IUPAC, Confederation of Upper Rhine Universities, French National Committee for Chemistry and the French National Research Center. The Honorary President is Prof. Jean-Marie Lehn and the Chairman of the Regional Scientific Committee Prof. Guy Ourisson (Past Secretary General of IUPAC).

The conference aims to provide an up-to-date overview of the chemistry of natural products from the smallest to the largest biomolecules. in line with previous symposia of this series, it is hoped that major new results will be presented. For the first time, a section will cover interstellar and meteoritic organic chemistry, as sell as prebiotic chemistry and organic geochemistry. A large section will be devoted to the

more traditional topics: synthesis; determination of molecular structures; and biologically important functions.

The International Symposium on Siderophores, a separate meeting, will be held at the same time in the same hall with joint registration, and will therefore offer some diversification.

In contrast to previous symposia of this series, there will be no parallel sessions; all the lectures will therefore be plenary. Ample space will be available for continuous poster presentations, with the help of invited 'poster leaders.' It is hoped even that a light lunch will be available to all participants to facilitate poster discussions. Some quiet rooms will be available for impromtu discussions.

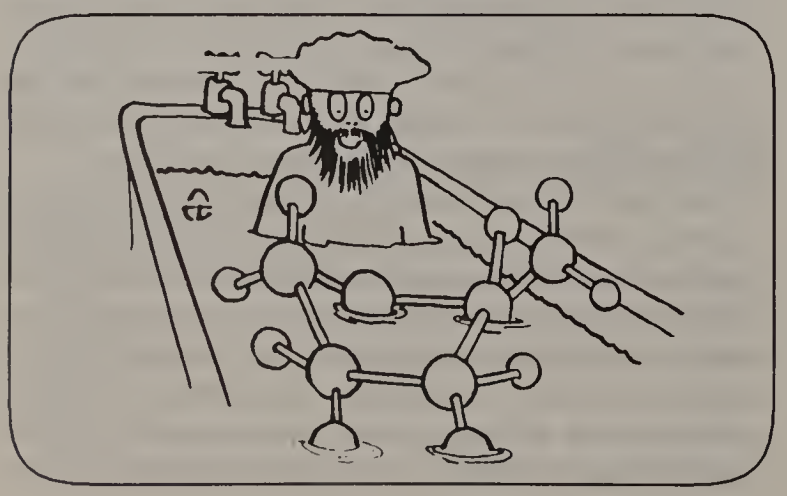
The scientific programme will include the following plenary speakers: P. Albrecht, A. R. Battersby, D. Boger, W. Boland, A. Brack, D. P. Curran, P. Deslongchamps, D. L. Bai, A. Eschenmoser, S. Hanessian, G. Joyce, O. Kennard, H. Kunz, S. Ley, G. Q. Lin, D. Lynn, A. Marquet, K. Martinek, S. V. Moroz, Y. Naya, K. C. Nicolaou, D. Oesterheldt, J. Reisse, M. Rohmer, A. I. Scott, Chr. Tamm, D. Tanner, P. F. Vlad, V. Vlassov, G. Wächtershäuser, M. J. Wyvratt, J. S. Yadav.

Exhibitions of scientific equipment and publications will be presented, as well as non-book information services and software for use in organic chemistry. Visits to industrial sites and the beautiful Upper Rhine Valley, both sides of the Rhine, will be organized.

The conference fees will range from ECU 50 to ECU 300 (ECU = European Currency Unit) with the usual 10% discount for IUPAC affiliates. Accommodation will be available in several hotels in the immediate vicinity of the symposium site as well as in student residences.

Strasbourg, a medium-sized city (population *c.* 300 000) is more than 2000 years old and is one of the most beautiful centres in Europe. It is the site of an exceptionally beautiful cathedral and of a renowned university. The city is situated near the Rhine. The neighbouring Universities of Basel, Freiburg/Br., Mulhouse, Strasbourg and Karlsruhe coordinate part of their activities in the framework of the "EUCOR" Confederation of Upper Rhine Universities; this is why, for the first time, a symposium of this series is organized on a regional, tri-national basis, with financial help from Switzerland, Germany and France.

Some funds have been obtained to offer a limited number of fellowships covering registration and living expenses (but not travel) for some young participants from developing countries or from Southern Europe, or from Eastern and Central Europe.



Medicinal chemistry
Basel, Switzerland
13–17 September 1992

IUPAC SPONSORED

The 12th International Symposium on Medicinal Chemistry will take place in Basel, Switzerland, on 13–17 September 1992. The symposium is being organized by the Medicinal Chemistry Section of the Swiss Chemical Society under the joint sponsorship of the European Federation of Medicinal Chemistry (EFMC), the Division of Medicinal Chemistry of the American Chemical Society and IUPAC.

The symposium will be held at the Basel Convention Centre, situated at the Messeplatz about half a mile from the city centre. It will be the venue for the biennal EFMC gatherings of medicinal chemists and scientists from other disciplines engaged in drug research and related fields. The organizers attach great importance to the international character of the meeting. An attractive scientific programme will be presented, featuring some of the most significant advances and trends in drug research.

The inaugural lecture on 'Medicinal chemistry: to the future' to be delivered by Prof. D. Triggle, will set the theme of the symposium. The following topics will then be addressed in four plenary sessions and 36 main lectures, divided among three parallel sessions:

- proteases and their inhibitors;
- the immune system as a drug target;
- peptidomimetics acting on peptide receptors;
- selected enzyme inhibitors;
- drugs acting on CNS receptors;
- drugs acting nucleic acid and nucleic-acid processing enzymes;
- ion channel modulators;
- selected new topics;
- approaches to lead finding and optimisation;
- molecular toxicology;
- prodrugs and targeted drug delivery.

The main lectures will be complemented by 52 oral communications, selected by the Scientific Committee from the posters and abstracts submitted; each will last 15 minutes and will be followed by a 5-minute discussion. More than 500 posters are expected, indicating that there will be a substantial attendance. The official language of the symposium will be English: no provision will be made for simultaneous translation.

The registration fees, which will include the costs of the volumes of abstracts and proceedings, a five-day ticket valid for unlimited travel on public transport in

The 12th International Symposium on Medicinal Chemistry will be held at the Basel Convention Centre.

Basel, coffee breaks, and some of the social events, will be:

CHF 600 for active participants
(CHF 700 if paid after 1 June, 1992);
CHF 200 for students and retired scientists
(CHF 250 if paid after 1 June, 1992);
CHF 100 for accompanying persons.

Hotel accommodation in all price categories can be arranged through: Basel Hotelreservation, PO Box, CH-4021 Basel, Switzerland

Basel is one of the oldest towns in Europe and the second largest city in Switzerland. Here, where the frontiers of three nations converge, modern science flourishes amidst historical surroundings. Basel is a cultural centre with a rich artistic and academic life, a renowned collection of pictorial art, and many significant and interesting museums. It is also the home of Switzerland's major pharmaceutical companies, the Biozentrum of the University, the Institute of Immunology and the Friedrich Miescher Institute, all research centres of world-wide repute.

In mid-September, the weather in Basel is generally mild and dry. During the day, temperatures may range from 15 to 20°C (roughly 60–65°F), and in the evenings it rarely gets colder than 10°C (50°F).

Education in analytical chemistry

The 2nd FECHEM Conference on Education in Analytical Chemistry will be organized by the Czecho–Slovak Chemical Society on behalf of the Working Party on Analytical Chemistry of the Federation of European Chemical Societies at Charles University, Prague, from 31 August to 1 September 1992.

The theme of the conference will be 'Analytical chemistry – a key for a safer future for mankind.' The conference will deal with all aspects of education in analytical chemistry and will consist of invited plenary lectures, contributed oral and poster presentations, a panel discussion and a section devoted to audiovisual aids and the use of computers for education in analytical chemistry.

Contact address: Dr J. Barek, Department of Analytical Chemistry, Charles University, Albertov 2030, 128040 Prague 2, Czechoslovakia. Tel: +42 (2) 292051 or +42 (2) 297541. Fax; +42 (2) 291958. E-mail: NEMEC at CSEARN.

Research in chemical education

The 1st European Conference on Research in Chemical Education, organized by the Federation of European Chemical Societies Working Party on Chemical Education, will be held in Montpelier, France, on 25–28 August 1992.

Further details from: "1ère Conférence Européenne sur la Recherche en Didactique de la Chimie,' CIFEC – CP 016, Université Montpellier II, 3095 Montpellier Cedex 05, France.

Waste management problems in agro-industries

The 2nd International Symposium on Waste Management Problems in Agro-Industries will be held in Istanbul, Turkey, on 23–25 September 1992. The meeting is sponsored by the International Association of Water Pollution Research and Control (IAWPRC). The official language of the symposium will be English.

The field of agro-industries embraces a wide spectrum of subjects in industrial waste management in connection with a number of major industries such as textiles, pulp and paper, leather, food, sugar, edible oils, beverages, animal waste disposal, egg production and so on.

The purpose of the symposium is to promote collective efforts towards the development of acceptable approaches for waste management in agro-industries by providing a forum for discussion of as many significant aspects as possible. Although a wide spectrum of scientific and technical interests will be presented at the meeting, the major emphasis will focus on:

- Pollution profile of agro-industries; waste characterization and categorization;
- problems of effluent quality management;
- control and treatment technologies, the concept of pretreatment;
- waste management problems in hot and cold climates, agro-industries in tropical countries.
- in-plant technologies;
- treatment of strong wastes: fundamental and technological aspects;
- energy recovery and reuse systems;
- aspects of sludge utilization.

For further information contact: KONGRESIST Inc. 193 Cumhuriyet Cad, Apt 6, Elmadag, 80230 Istanbul, Turkey. Tel: +90 (1) 147 22 51 or +90 (1) 146 22 49. Telex: 31118 cong tr. Fax: +90 (1) 148 76 78.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1992

Biological and environmental reference materials

11–14 May. 5th International Symposium on Biological and Environmental Reference Materials (BERM-5). Aachen, Germany.
(Dr. Markus Stoeppler, Institut für Angewandte Physikalische Chemie (IPC), Forschungszentrum Jülich (KFA), Postfach 19 13, D-W-5170 Jülich, Germany. Tel. +49 (2461) 613179. Telex 833 556 KF D.)

Calorimetry and thermodynamics of biological processes

15–19 May. International Symposium on Calorimetry and Thermodynamics of Biological Processes. Fiskebäckskil, Sweden.
(8th ISBC, Department of General & Marine Microbiology, Carl Skottsbergs Gata 22, S-41319 Göteborg, Sweden.)

Heteroatom chemistry

7–12 June. 3rd International Conference on Heteroatom Chemistry. Riccione, Italy.
Prof. A. Fava, CNR – ICoCEA, Via della Chimica, 8, I-40064 Ozzano Emilia-BO, Italy.)

Liquid crystals

21–26 June. 14th International Liquid Crystal Conference. Pisa, Italy.
(Secretariat 14th ILCC, Department of Chemistry & Industrial Chemistry, University of Pisa, Via Risorgimento 35, 56126 Pisa, Italy. Tel. +39 (50) 587272. Fax. +39 (50) 587260/28438).

Organic synthesis

28 June–2 July. International Conference on Organic Synthesis. Montréal, Québec, Canada.
(Prof. Jean-Claude Richer, Départment de Chimie, Unviersité de Montréal, C.P. 6128 Succursale A, Montréal, Quebéc H3C 3J7, Canada. Tel. +1 (514) 3436744. Fax. +1 (514) 3436624.)

Surface chemistry, adsorption and chromatography

29 June–3 July. 2nd International Symposium on Surface Chemistry, Adsorption and Chromatography. Moscow, Russia.
(Prof. O. Larionov, Institute of Physical Chemistry, Academy of Sciences, Leninski, Prospekt 31, Moscow 117915, Russia.)

Carbohydrates

5–10 July. 16th International Carbohydrates Symposium. Paris, France.
(Prof. Jean-Claude Depezay, General Secretary, XVIth International Carbohydrate Symposium, Laboratoire de Chimie URA 400, Université René Descartes, 45, rue des Saints-Pères, F-75270 Paris Cedex 06, France. Tel. +33 (142) 862176. Fax. +33 (142) 860402.

Ring opening polymerization

7–11 July. International Symposium on Ring Opening Polymerization. Warsaw, Poland.
(R.O.P. Organizing Committee, Institute of Polymer Chemistry, Polish Academy of Sciences, ul. M. Curie-Sklodowskiej 34, 41-800 Zabrze, Poland.)

Solubility phenomena

8–10 July. 5th International Symposium on Solubility Phenomena. Moscow, Russia.
(Dr. K. G. Kravchuk, Symposium Secretary of 5th ISSP, N. S. Kurnakov, Institute of General and Inorganic Chemistry, Leninsky av., 31, 117907 GSP-1, Moscow, Russia. Fax +7 (095) 2341279.)

Computers in chemical research and education

12–17 July. 10th International Conference on Computers in Chemical Research and Education. Jerusalem, Israel.
(Professor Y. Wolman, Department of Organic Chemistry, The Hebrew University, Jerusalem 91904, Israel.)

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably **2 YEARS** and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *CI*, Vol. 11, No. 1, pp. 4–5, 1989.

Risk management of chemicals

13–16 July. International Symposium on Risk Management of Chemicals – Can Chemicals be Used Safely? Guildford, UK.
(Dr J. F. Gibson, Secretary (Scientific), The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Macromolecules

13–18 July. 34th International Symposium on Macromolecules. Prague, Czechoslovakia.
(IUPAC Macro 92 Secretariat, Intistute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského nám. 18882/2, 162 06 Prague 6, Czechoslovakia. Tel. +42 (2) 360317. Telex 122019 IMCP C.)

Chemistry, agriculture and the environment

16–18 July. International Conference on Chemistry, Agriculture and the Environment. Guildford, Surrey, UK.
(Dr. D. Stevenson, Robens Institute of Health & Safety, University of Surrey, Guildford, Surrey GU2 5DX, UK.)

Coordination chemistry

19–24 July. 29th International Conference on Coordination Chemistry, Lausanne, Switzerland.
(29th ICCC Secretariat, AKM Congress Service, Clarastrasse 57, P.O. Box, CH-4005 Basel, Switzerland. Tel. +41 (61) 6915 111. Fax. +41 (61) 6918189.)

Novel aromatic compounds

19–24 July. 7the International Symposium on Novel Aromatic Compounds. Victoria, B.C., Canada.
(Dr R. H. Mitchell, Department of Chemistry, University of Victoria, Box 3055, Victoria, B.C., Canada V8W 3P6.)

Photochemistry

19–25 July. 14th International Symposium on Photochemistry. Leuven, Belgium.
(14th IUPAC Symposium on Photochemistry, c/o Prof. F. C. de Schryver, K. U. Leuven, Department of Chemistry, B-3001, Celestijnenlaan 20F, Heverlee, Belgium. Tel. +32 (16) 200656. Fax. +32 (16) 201215.)

Physical organic chemistry

2–7 August. 11th International Conference on Physical Organic Chemistry. New York, USA.
(Prof. H. F. Koch, Department of Chemistry, Ithaca College, Ithaca, NY 14850, USA.)

Exploration, mining and processing of materials

2–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, Republic of South Africa.
(The Symposium Secretariat, Mintek, Private Bag X3015, Randburg, 2125 South Africa. Tel. +27 (11) 7933511. Fax. +27 (11) 7932413. Telex 424867 SA.)

Macrocyclic chemistry

9–14 August. 17th International Symposium on Macrocyclic Chemistry, Provo, Utah, USA.
(Chemistry Department, ISMC, 226 ESC, Brigham Young University, Provo, Utah 84602, USA. Tel. +1 (801) 3782315. Fax. +1 (801) 3785474.)

Chemical thermodynamics

16–21 August. 12th International Conference on Chemical Thermodynamics (ICCT). Utah, USA.
(Chemistry Department: ICCT, 226 ESC, Brigham Young University, Provo, Utah 84602, USA. Tel. +1 (801) 3786269. Fax. +1 (801) 3785474. Telex 706448.)

Dates of 37th IUPAC General Assembly

The dates of the next 37th IUPAC General Assembly have been amended slightly. The General Assembly will now be held from Thursday 5th to Thursday 12th August 1993. The venue remains the same: Lisbon, Portugal.

Biotechnology

16–21 August. 9th International Biotechnology Symposium. Crystal City, Virginia, USA.
(9th International Biotechnology Symposium Headquarters, American Chemical Society, 1155 Sixteenth Street, N.W., Room 205, Washington, D.C. 20036–4899, USA. Tel. +1 (202) 8726286. Fax. +1 (202) 8726128.)

Flame structure

18–22 August. 4th International Seminar on Flame Structure. Novosibirsk, Russia.
(Prof. V. E. Zarko, Chairman IV-ISFS, Institute of Chemical Kinetics and Combustion, Novosibirsk 630090, Russia. Tel. +7 (383) 2357030. Fax. +7 (383) 2352350.)

Natural products

30 August–4 September. 18th International Symposium on Natural Products. Strasbourg, France.
(Prof. G. Ourisson, Centre de Neurochimie, 5 rue Blaise Pascal, F-67084 Strasbourg, France. Tel. +33 88600513. Fax. +33 886707620. Telex ULP 870260F.)

Raman spectroscopy

31 August–4 September. 13th International Conference on Raman Spectroscopy. Würzburg, Germany.
(Prof. W. Kiefer, Institut für Physikalische Chemie, Universität Würzburg, Marcusstrasse 9–11, W-8700 Würzburg, Germany.)

CHEMRAWN VIII

6–9 September. World Conference: Chemistry and Sustainable Development Towards a Clean Environment, Zero Waste and Highest Energy Efficiency. Moscow, Russia.
(Prof. V. A. Koptyug, Presidium of Russian Academy of Sciences, Leninskii Prospekt 14, 117901 Moscow, Russia. Fax. +7 (095) 2302043/2302630. Telex 411964 ANS SU.)

Nickel metabolism and toxicology

7–12 September. 5th International Conference on Nickel Metabolism and Toxicology. Ontario, Canada.
(5th International Conference on Nickel Metabolism and Toxicology, c/o Falconbridge Limited, Ms. Margaret Koski, Falconbridge, Ontario, Canada POM 1SO. Tel. +1 (705) 6932761. Fax. +1 (705) 5662107.)

Medicinal chemistry

13–17 September. 12th International Symposium on Medicinal Chemistry. Basel, Switzerland.
(XIIth International Symposium on Medicinal Chemistry, Administrative Secretariat, PO Box 141, CH-4007 Basel, Switzerland.)

Macrocyclic ligands

14–16 September. International Symposium on Macrocyclic Ligands for the Design of New Materials. Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Chairman, International Symposium on Macrocyclic Ligands for the Design of New Materials, Chemistry Department, University of Surrey, Guildford GU2 5XH, Surrey, UK. Tel. +44 (483) 571281 ext. 2588. Telex 859331 G. Fax. +44 (483) 300803.)

Organic substances in soil and water

14–17 September. International Conference on Organic Substances in Soil and Water. Lancaster, UK.
(Miss C. Martin, Centre for Research on Environmental Systems, Institute of Environmental and Biological Sciences, University of Lancaster, Bailrigg, Lancaster, LA1 4YQ, UK. Tel. +44 (524) 6520. Fax. +44 (524) 843854.)

Analytical chemistry

20–26 September. SAC 92: International Conference on Analytical Chemistry. Reading, UK.
(The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK. Tel. +44 (71) 4378656.)

Excited state electron transfer and related phenomena

26 September–1 October. International Symposium on Experimental and Theoretical Aspects of Excited State Electron Transfer and Related Phenomena. Pultusk, Nr. Warsaw, Poland.
(Dr J. Waluk, Institute of Physical Chemistry, Polish Academy of Sciences, Kasprzaka 44, P1 01–224 Warsaw, Poland.)

Polymer spectroscopy

29 September–2 October. 10th European Symposium on Polymer Spectroscopy. St Petersburg, Russia.
(ESCOPS–10th Organizing Committee, Dr. Purkina A.V., Mrs. Kovalenko I.V, Institute of Macromolecular Compounds, Bolshoi Prospect 31, St Petersburg 199004, Russia. Tel. +7 (812) 2184001. Fax. +7 (812) 2186869.)

Mycotoxins and phycotoxins

8–12 November. 8th International Symposium on Mycotoxins and Phycotoxins. Mexico City, Mexico.
(Dra. Magda Carvajal, Secretariado del Simposio, VIII Simposio Internacional IUPAC sobre Micotoxinas y Ficotoxinas, Insurgentes Sur 3700-C, Apartado Postal 101–63, 04530 México, D. F. Tel. +52 (5) 5505883. Fax. +52 (5) 5488207. Telex 1774523 UNAMME.)

1993

Thermodynamics of solutions and biological systems

3–5 January. International Conference on Thermodynamics of Solutions and Biological Systems. New Delhi, India.
(Prof. D. V. S. Jain, Department of Chemistry, Panjab University, Chandigarh 150 014, India. Tel. +91 (172) 31435, 26629. Telex 395464 RSIC IN.)

Bioorganic chemistry

7–10 June. 2nd International Symposium on Bioorganic Chemistry. Fukuoaka, Japan.
(Symposium Secretariat, 2nd International Symposium on Bioorganic Chemistry, Department of Chemical Science and Technology, Faculty of Engineering, Kyushu University 36, Higashi-ku, Fukuoka 812, Japan. Fax. +81 (92) 6321842.)

Carotenoids

20–25 June. 10th International Symposium on Carotenoids. Trondheim, Norway.
(Prof. S. Liaaen-Jensen, Laboratory of Organic Chemistry, The Norwegian Institute of Technology, University of Trondheim-NTH, N-7034 Trondheim-NTH, Norway.)

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J D Connolly and R A Hill

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.
Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 44 countries, each represented by a national organization, such as an academy of science or research council.

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The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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International Union of Pure and Applied Chemistry

Survey of Chemists

The following letter from IUPAC President Allen J. Bard invites chemists to offer their advice and recommendations on projects that might be addressed within IUPAC programmes.

Dear chemist,

Each year the various commissions and committees of IUPAC undertake many projects. In general, these projects are related to the needs of world chemists and the role of chemistry in meeting the needs of mankind. These often deal with problems of nomenclature, symbols, terminology, and conventions. They also include critically evaluated data compilations, recommended measurement procedures and analytical methods, recommended standards, and guidelines for publication. Details of these projects regularly appear in *Chemistry International*, for example in the sections 'Commission & Committee News' and 'Recent Reports'.

Although the various bodies of IUPAC contain chemists who are very knowledgeable in their specialties, it is clearly not possible to cover the full breadth of chemistry within the limited membership of the Union. Thus there may be important problems and projects suitable for IUPAC study that are not undertaken in a timely manner. We are therefore soliciting the chemistry community (through its IUPAC affiliates and other readers of *CI*) and the editors of leading chemistry journals for advice and recommendations on projects that might be addressed within IUPAC programmes. If you know of such projects, please complete the brief form below and send it to the IUPAC Secretariat for consideration by the appropriate IUPAC body.

Thank you for your advice and interest.

Sincerely,

Allen J. Bard

IUPAC Survey of Chemists

To: Dr Michael Freemantle
IUPAC Secretariat
Bank Court Chambers
2–3 Pound Way
Templars Square, Cowley
Oxford OX4 3YF
UK.

From: (proposer)

Suggested project title:

Brief description of nature of problem:

Suggested experts (names and addresses) in this area:

Author deadlines for *CI* 1993

The following are the deadlines for receipt of items at the IUPAC Secretariat in Oxford for publication in 1993 issues of *Chemistry International* (*CI*). Authors of feature articles and other lengthy items should submit their contributions well in advance of these dates. Since *CI* is a news magazine it is not possible to guarantee publication of any item in a particular issue. In many cases it is necessary to postpone publication of material to a later issue.

Please note that the International Organization for Standardization (ISO) agreed format for writing dates is used as follows: year–month–day.

CI *Vol. 15, 1993 Issue*		*Deadline for receipt of material*
No. 1	(January)	92.10.5
No. 2	(March)	92.11.30
No. 3	(May)	93.2.1
No. 4	(July)	93.4.5
No. 5	(September)	93.6.7
No. 6	(November)	93.8.2

Authors submitting contributions to *CI* are asked to refer to '*Chemistry International*: guidelines for authors' (*CI* , Vol. 13, No. 1, pp. 8–9, 1991). Copies of these guidelines are available from The Editor, *Chemistry International*, at the IUPAC Secretariat in Oxford.

Water research

The Committee on Water Research (COWAR) was created by the International Council of Scientific Unions (ICSU) in 1964. At the 16th ICSU General Assembly in 1976 a proposal was adopted that COWAR become a Joint Committee of ICSU and UITA, the Union of International Technical Associations and Organizations. Appropriate ICSU and UITA bodies appoint members providing an interesting mix of science and engineering.

The role of COWAR is to promote necessary contacts between the professional international non-governmental water-orientated organizations, and to stimulate interrelationships and integrative approaches where society asks for combined involvement of various specializations. Through COWAR, the fields of interest of the water-orientated organizations can be matched, so that their activities pertaining to water research will complement each other and unnecessary duplications and gaps in their activities will be avoided for the common benefit of all the organizations and of the people they ultimately service. COWAR acts also as an advisor on behalf of ICSU and UITA to international inter-governmental organizations including UNESCO, FAO, WHO and UNEP on problems relating to water research and to programmes concerned with water.

COWAR has recently published a booklet containing profiles of water-related associations entitled *Our planet needs global co-operation on water research.* The booklet includes a profile of IUPAC. Dr Tony Dobbs, Chairman of the IUPAC Commission on Water Chemistry (VI.6) is the IUPAC representative on COWAR.

For further details please contact: COWAR Secretariat, c/o CHO-TNO, PO Box 6067, 2600 JA Delft, The Netherlands. Tel: +31 (15) 69 7262. Fax: +31 (15) 56 4801.

Biological reference materials

The International Federation of Clinical Chemistry (IFCC) Committee on Quantities and Units and the IUPAC Commission on Quantities and Units in Clinical Chemistry have been concerned about the difficulties experienced in the clinical laboratory in the diagnostic use of World Health Organization (IFCC) biological reference materials. These difficulties arise mainly because the kind of quantities specified by these reference materials is not as readily understood as base kind-of-quantities such as amount of substance (in mol). There is often also a lack of information about the correct standard to be used and the mode of expression of results.

These problems were discussed in outline at a meeting with representatives of WHO in February 1990, and it was agreed that some of these issues might best be resolved by setting up a consulting working group. A Consulting IFCC/IUPAC/WHO Working Group on 'The Application of IUPAC/IFCC Recommendations on Quantities and Units to WHO Biological Reference Materials for Diagnostic Use' was therefore set up, consisting of: Dr P. L. Storring (IFCC/IUPAC, Chairman), Dr R. Dybkaer (IFCC), Dr C-C. Heuck (Health Laboratory Technology and Blood Safety, WHO), Dr H. P. Lehmann (IUPAC), Dr D. Magrath (Biologicals, WHO, Dr P. Sizaret (Biologicals, WHO), and Dr R. Zender (ISO).

This Group held its first meeting at WHO in Geneva on 28–29 January 1991. After a wide-ranging exchange of information and views regarding the use of WHO reference

materials in the clinical laboratory field, several principles and proposals were agreed based on the published recommendations of ISO (International Organization for Standardization), IFCC and IUPAC.

The topics covered included: (a) the description of the results of a quantity measured in the clinical laboratory; (b) the advantages of being able to use SI units rather than units outside SI, such as international units; (c) the role of the international units in measurement values of a quantity of component (analyte) that does not have a known elementary entity; (d) the relevance of international units based on biological procedures to the calibration of immunological procedures; and (e) the need to examine information relating to existing and proposed WHO reference materials to see whether knowledge about the component(s) would allow defining a kind-of-quantity based on amount-of-substance and assuming a value with an SI unit. The characteristics required for a reference material and the procedures to be used for its collaborative study and calibration were also reviewed.

The detailed conclusions and proposals from the meeting are contained in a summary report. The Consulting Working Group would welcome comments on this report from interested readers and intends to consider these at a subsequent meeting so as to draft a set of recommendations.

Copies of the report are available from, and comments on it should be sent to: Patrick L. Storring, National Institute for Biological Standards and Control, Blanche Lane, South Mimms, Potters Bar, Herts. EN6 3QG, UK. Tel: +44 (707) 54753. Fax: +44 (707) 46730.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions will be published in *Pure and Applied Chemistry* and synopses of thgese published in *CI* as recent reports.

If you would like to coment on these provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of national/regional centres apeared in *CI*, Vol. 14, No. 1, p. 25, 1992.

Glossary of terms used in toxicology

The glossary is compiled primarily for chemists who now find themselves working in toxicology or requiring a knowledge of the subject. Faced with an extensive literature and terms that are not always defined in accessible dictionaries, newcomers to the subject can have great difficulty in obtaining the background knowledge essential for their work. Further, many toxicologists, whose previous experience has been limited to clinical and experimental toxicology, now have to assess possible environmental effects of chemicals and require to understand terms used in ecotoxicology. Equally, specialists in ecotoxicology often lack knowledge of the terms used in clinical and experimental toxicology.

Satisfying the requirements of the various groups now concerned with the generation or use of toxicological knowledge is a wide remit and hence the terms to be included in this glossary have come from a wide range of disciplines. Many medical terms are included because of their frequent occurrence in the toxicological literature and because chemists would not normally be expected to be familiar with them. Major epidemiological terms are included for the same reason. Specialists in these and other areas may believe that such terms can be omitted because they are well defined elsewhere. While this glossary may err on the side of including peripheral terms, it is believed that some redundancy of content is preferable to the difficulties currently presented to a newcomer to toxicology in having to consult several dictionaries in order to make any start at all with the subject.

Comments on the document are welcome and should be sent by 28 February 1993 to: Dr John H. Duffus, Department of Biological Sciences, Edinburgh Centre for Toxicology, Heriot-Watt University, Edinburgh EH14 4AS, UK.

Standard quantities in chemical thermodynamics: fugacities, activities and equilibrium constants for pure and mixed phases

The standard chemical potential μ is defined in terms of a specified state of aggregation, a specified temperature and a specified standard pressure. Other standard thermodynamic quantities are obtained from μ by the usual mathematical operations.

In the publication definitions are given for the standard chemical potential of a substance B in the following states of aggregation: gas phase whether pure or mixed, condensed phase whether pure or mixed, solvent substance in solution, and solute substance in solution. Fugacities and virial coefficients, and osmotic coefficients in the discussion of condensed phases.

Expressions for the standard equilibrium constant are given for a reaction in the gas phase, in a condensed phase and in a solution. Some numerical examples are given and relative magnitudes of various terms in the equations are illustrated.

Comments on the document are welcome and should be sent by 28 February 1993 to: Dr M. B Ewing, Department of Chemistry, University College London, 20 Gordon Street, London WC1H 0AJ, UK.

Chemistry in Lesotho

IUPAC affiliate Dr Tebello Nyokong describes activities in the Chemistry Department at The National University of Lesotho, Roma, Lesotho.

Lesotho is a small country completely surrounded by the Republic of South Africa. The total land area is 30 335 km^2 and 75% of this is mountains. The population of Lesotho is approximately 1 600 000.

The National University of Lesotho was founded in 1945 as a Catholic College called Pius XII, which was later replaced by the University of Lesotho, Botswana and Swaziland. In 1975, the National University of Lesotho was established. The present student population at the National University of Lesotho is approximately 1400, with a male:female ratio of nearly 50:50. About one-third of the student population are in the Faculty of Science.

All first-year students in the Faculty of Science do a common first year consisting of chemistry, biology, mathematics and physics. Students begin to specialize in their second year, although the general trend is to do a double major in two science subjects. The favourite combination involving chemistry is its combination with biology, since many students enter the university with the aim of becoming medical doctors.

The Chemistry Department

On average, there are 150 BSc students in the first year. Approximately 70 students take second-year chemistry, this number drops to about 50 in the third year and finally to about 30 in the fourth year. The department does not offer post-graduate degrees as yet.

There are nine established academic posts in the department, the ninth post being occupied by a demonstrator, whose main duty is to assist with first-year laboratories. One of the posts is sponsored by the British Council. The rest are locally funded. Two of the posts are presently filled by contracted expatriate staff. Four of the local academic staff members are female, two are male. The local staff members were trained mainly in Canada and the UK for their post-graduate studies. There are five technical staff members in the department.

The department offers courses in analytical/inorganic, physical, organic, industrial and environmental chemistries, and in spectroscopy. Senior students may also do a project in any field. The department also offers some of these courses to education students.

Chemistry Department, National University of Lesotho, Roma, Lesotho.

Basic research

There are a few basic research activities being carried out by the members of the department. The research activities are, however, minimal because of limitations in research equipment. Staff members rely on their visits overseas, to more equipped laboratories, for the more elaborate work on their research.

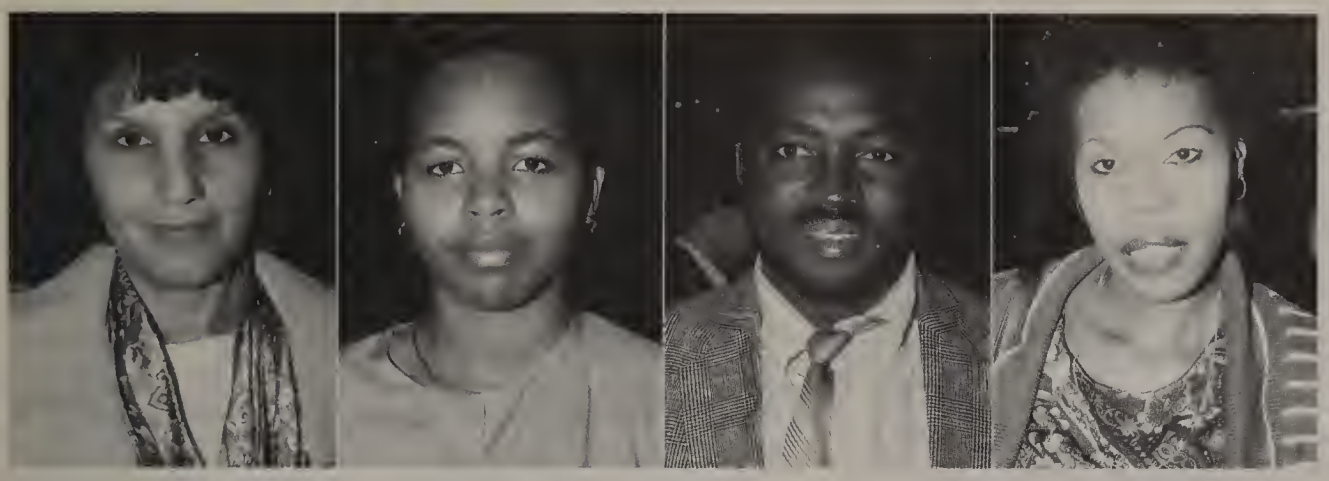
Dr T. Jonathan's research involves the study of the chemistry of medicinal and edible plants in Lesotho. Dr B. Tittle and Mr P. Tseki are working on the chemistry of CuH and on reactions with chelating ligands. My own work concerns the photochemical properties of the phthalocyanine complexes, particularly the biologically important molybdenum complex. I am also involved in research on environmental pollution in Lesotho.

Have you received your affiliate documents?

Every affiliate receiving a copy of the May 1992 issue of *CI* should have found, inserted in the magazine, a white envelope addressed to affiliates. The envelope contained the following documents:

- a letter from the IUPAC Affiliate Affairs Secretary explaining the benefits of affiliate membership;
- a table of atomic weights to four significant figures;
- an IUPAC affiliate membership card valid until May 1993;
- an IUPAC affiliate membership certificate;
- an IUPAC affiliate membership registration form to be completed and returned to the IUPAC Secretariat before 31 October 3 1992;
- guidelines on how to complete the registration form.

If your copy of the magazine did not contain this package of documents *and* you are a registered affiliate for 1992, then please inform the Affiliate Affairs Secretary at the IUPAC Secretariat. He will be pleased to send you replacement documents.



Four of the 25 chemists who participated at the CHEMRAWN VII Training Workshop: (from left) Alicia De Adams (Dominican Republic); Dawn Barrett (Jamaica); Collins A. Angwe (Cameroon); and Esther Lugwisha (Tanzania).

Affiliates at CHEMRAWN VII Training Workshop

All 25 young chemists who attended the EPA-sponsored CHEMRAWN VII Training Workshop in the USA last December have been registered as IUPAC affiliates under the IUPAC sponsorship programme. This programme provides free affiliate subscriptions for a limited number of young chemists from developing countries. The workshop was organized by IUPAC affiliate William E. Wilson. Reports of CHEMRAWN VII and the Training Workshop appear on pages 146–151 of this issue.

Affiliates in Japan

The IUPAC affiliate membership programme in Japan is administered by The Chemical Society of Japan. In 1992 over 200 chemists have registered through the society.

The photograph shows affiliate Prof. Taitiro Fujinaga (left) who is a past member of the IUPAC Analytical Chemistry Division Committee and Commission on Electroanalytical Chemistry. Affiliate Shuzo Seki (centre) is a past member of the IUPAC Commission on Thermodynamics.

The photograph was taken at an IUPAC Affiliate Meeting held in Kyoto. About 100 chemists attended the meeting which included two plenary lectures concerning carbon dioxide and the global environment. Prof. Yasushi Kitano (right) was one of the guest lecturers. He is President of Sugiyama Women's Univeristy, Nagoya.

For further information about IUPAC Affiliate Membership in Japan please contact: Mrs Ryoko Negishi, Membership Division, The Chemical Society of Japan, 1–5 Kanda Surugadai, Chiyoda-ku, Tokyo, 101 Japan. Tel: +81 (3) 3292 6161. Telex: 02226198 CSJ J. Fax: +81 (3) 3292 6318.

Information for affiliates

IUPAC publications

Affiliates are entitled to a minimum 25% reduction on the cost of all IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications together with an order form may be obtained from the IUPAC Secretariat.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available free of charge to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 x 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC programme on chemistry and the environment* have been distributed to members of IUPAC commissions and committees, national adhering organizations and other bodies associated with IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Affairs Secretary.

Ties and scarves

IUPAC ties and scarves may be purchased from the IUPAC Secretariat by applying to the Affiliate Affairs Secretary. The colours for both are *either* maroon or navy (dark) blue. The ties cost USD 14.00/GBP 7.00 each and the scarves USD 12.00/GBP 6.00 (including postage and packing).

Please use the form (or a photocopy of it) published on page 88 of the July 1990 issue of *CI*. Alternatively please write to the Affiliate Affairs Secretary with your order stating the colour you require. A cheque made payable to IUPAC for the appropriate amount should be enclosed with your order.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2–3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK
Tel: +44 (865) 747 744
Fax: +44 (865) 747 510
Telex: 83147 VIA OR G attn. IUPAC

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC comissions.

A full list of names and addresses of all commission officers for 1991–93 was published on pages 223–233 of the November 1991 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually–but not always–announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal.

Letters to the Editor

Stoichiometric quantities

Sir,

I agree with Prof. Rocha-Filho[1] that IUPAC should recognize the Avogadro number (6.02×10^{23}) as well as the Avogadro constant (6.02×10^{23} mol^{-1}). However, I think 'number' and 'constant' sufficiently distinguish the two, and suggest that L always be used for the constant, allowing N_A to represent the number (N = number).[2]

Professor Rocha-Filho says that 'relative masses are quantities that cannot be logically intermingled with the mass of a sample of a substance, the number of entities in the sample, or even the substances's molar mass'. I am not sure what he means by 'intermingled' here, but if he is saying that relative masses cannot be used alongside these quantities in a logical manner, he is mistaken.[3] He may be stoichiometry more difficult for students.[4]

P. G. Nelson
University of Hull
UK

References

1. Rocha-Filho, R.C. *Chem. Int.*, Vol. 13, No. 6, pp. 213–214, 1991.
2. Cf. Mills, I., Cvitas, T., Homann, K., Kallay, N., Kuchitsu, K. *Quantities, Units and Symbols in Physical Chemistry*. Blackwell Scientific Publications, Oxford, p. 37, 1988.
3. Nelson, P. G. *Educ. Chem.*, Vol. 28, pp. 103–104, 1991.
4. Ainley, D. *Educ. Chem.*, Vol. 28, pp. 18–19, 1991.

A 'Standard' Periodic Table

Sir,

Dr Nelson urges that the 'pyramided' form of the Periodic Table of the Elements should be adopted as standard.[1] I submit that it is a better idea to use different forms of the table, according to what aspect of the Periodic Law one wishes to emphasize.

Mazurs[2] has surveyed and classified some 150 different versions of the table. The fact that the subject is still being actively debated, after so much study and controversy, indicates that to formulate a fully satisfactory all-purpose table may not be an achievable aim.

The format favored by Nelson is of the 'long' type, in which the lanthanide and actinide elements are listed in continuous atomic number order. In contrast, the popular 'medium' format, as well as the 'short' format, require that the lanthanide and actinide elements be placed in a separate section. But why not? These elements do *in fact* constitute a special group, in that they are more similar to one another than to any of the elements preceding them; consequently, the Periodic Law does not apply to them in a meaningful way.

I think that, for most purposes, the best format is the 18-column one, with the Li–Cl sequence interrupted so that the transition elements can be located between the Be-Group and the B-Group. Moreover, I favour labelling the groups in the way I have just illustrated; this scheme is much easier to keep in mind than that of numbering them 1 to 18.

According to Mazurs, the medium, interrupted format of the table was prefigured in a footnote to the first paper published by Mendeleev on the periodic system, but it does not appear explicitly in any of his papers.[2] The two tables shown in his principal paper[3] are of the medium and of the short type, respectively. In the former table, the homologous elements are arranged horizontally, and the Li–Cl sequence is not interrupted.

Because most of the lanthanide elements had not yet been discovered, at the time the question of a long format did not arise.

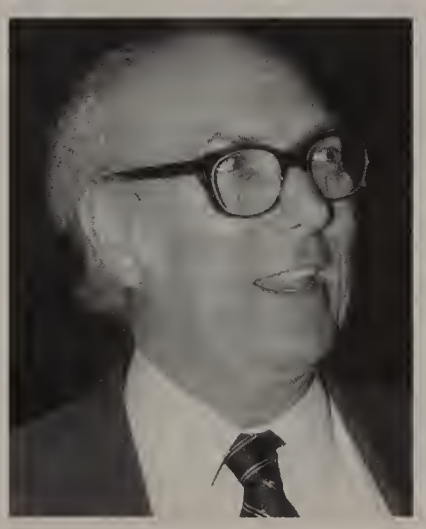
George Gorin, Affiliate Member
Oklahoma State University
Stillwater, OK 74078
USA

References

1. Nelson, P. G. *Chem. Int.*, Vol. 13, No. 5, p. 199, 1991.
2. Mazurs, E. G. *Graphic Representations of the Periodic System During One Hundred Years*. University of Alabama Press, Birmingham, 1957. (The various versions of the tables proposed and/or used by Mendeleev in 1869–1906 are listed on p. 240, with references to the original literature, and they are discussed elsewhere in the book.)
3. An English translation of the original article (*Liebigs Ann. Chim.*, Suppl. 8, pp. 133–229, 1871) was published serially in *Chem. News*, Vol. 40, p. 231, 1879 to Vol. 41, p. 126, 1880 (pagination is not consecutive). The cited tables are on p. 268.

PAC Review

Pure and Applied Chemistry (PAC) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.



IUPAC affiliate Dr Malcolm Chase.

Chemical thermodynamics

Plenary, Rossini and selected lectures presented at the 11th IUPAC Conference on Chemical Thermodyamics held in Como, Italy, on 26–31 August 1990, were published in the October 1991 issue of *PAC*. The lectures included several contributions from IUPAC affiliates.

For example, affiliate Malcolm Chase (National Institute of Standards and Technology, Gaithersburg, USA) co-authored a contribution with colleague S. Abramowitz (also at NIST) on 'Thermodynamic properties of gas phase species of importance to ozone depletion'. They reported that thermodynamic and spectroscopic data have been evaluated for several chlorine–oxygen gas-phase species of interest in the study of ozone-depletion models. The evaluated data have been used to compute JANAF Thermochemical Tables for these species. The paper discussed and applied the data to several proposed models for ozone depletion. The authors also discussed the recent catalytic cycle involving ozone loss by ClO and Cl_2O_2 in the Antarctic stratosphere.

Affiliate Harold L. Friedman and coworkers Fernando O. Raineri and Hua Xu at the State University of New York, USA, co-authored a paper on 'Structure and reactivity of ion hydration'. They outlined new and powerful methods used nowadays to study hydration complexes including neutron scattering methods. They also referred to the study of ion-solvent clusters in molecular beams, especially by spectroscopic techniques.

A team of four chemists at Brigham Young University, Utah, USA, contributed a paper on 'Thermodynamics of chemical interactions in aqueous solutions at elevated temperatures and pressures'. The authors, who included affiliate Dr Reed Izatt, pointed out that chemical reactions at elevated temperatures (100–350°C) and pressures (15–20 MPa) are important in many commercial, biological and geochemical environments.

'Assessing the credibility of the calorific content of municipal solid waste' was the topic of paper contributed by a team of eight scientists from the NIST Center for Chemical Technology. One of team was affiliate Dr Eugene Domalski. Their study aimed to establish the limits of reliability of the calorific content of municipal solid waste (MSW) by the bomb calorimetric procedure currently used in commercial test laboratories. They concluded that if proper care is taken in sampling large quantities of MSW and similar care is paid towards sample size reduction and subdivision, meaningful values can be obtained for the calorific content of MSW using the conventional bomb calorimetric procedures at the +1% level.

Latin-American Chemical Congress

Three of the plenary and section lectures presented at the 19th Latin-American Chemical Congress, Buenos Aires, Argentina, November 1990, were published in the November 1991 issue of *PAC*.

The first, by Derek H. R. Barton and Dario Doller (Texas A and M University, USA) is entitled 'The selective functionalisation of saturated hydrocarbons: Gif and all that'. The paper describes the Gif family of systems for the selective oxidation of saturated hydrocarbons. The mechanism of the reaction is analysed in terms of four intermediates. The first is well characterized as an ^{v}Fe σ-carbon bond species and the last has been fully identified, at least in the case of cyclohexane, as a hydroperoxide. The utility of dynamic ^{13}C NMR spectroscopy in iron containing systems is demonstrated. Gif type chemistry is closely related to the unusual enzyme methane monooxygenase.

The second paper, by Alois Haas (Bochum, Germany) has the title 'Periodic system of functional groups: formalism only or heuristic principles'. Haas points out that the element displacement principle provides a concept for the recognition of new radicals with element-like behaviour. It also allows the correlation of classical pseudohalogens with perfluoroorganoelement groups. Radicals derived in this way have the same valence–electron structure as the reference element and are termed 'paraelements'. They represent functional groups which can be incorporated without difficulty into the existing periodic system.

Ernest Eliel and four co-authors from North Carolina, USA, contributed a paper on 'Asymmetric synthesis and Carm's (chelate) rule'. A fourth paper published in the November issue of *PAC* (although not actually presented as a lecture at the congress) was by A. M. Castro Luna, A. E. Bolzán, M. F. de Mele and A. J. Arvia (Universidad Nacional de La Plata, Argentina). It concerned 'The voltammetric electrooxidation of glucose and glucose residues formed on electrodispersed platinum electrodes in acid electrolytes.'

Prof. Victor Gutmann

Liquid water

Professor Viktor Gutmann (The Technical University of Vienna, Austria) was President of IUPAC's Inorganic Chemistry Division from 1973 to 1975 and co-author of a paper on 'Intelligent molecules' published in the January 1988 issue of *CI*. At the 22nd International Conference on Solution Chemistry held in Linz, Austria, on 14–19 July 1991 Gutmann presented a plenary lecture on 'Fundamental considerations about liquid water'.

These considerations included a rationalization of the observable differentiations in liquid water and the anomalies observed in supercooled water and in superheated water. Gutmann evaluated the contribution of different 'kinds' of water molecules, namely (i) those at the interface, (ii) those around the dissolved gas molecules, (iii) those around hydrophilic solutes and (iv) the so-called 'normal' water molecules. His evaluation related to the existential requirements of the liquid, both in thermodynamic equilibrium and in metastable states. He applied the concept of 'supermolecular system organization' to liquid water, and offered suggestions on the role of water in the supermolecular system organizastions in non-aqueous solvents.

Gutmann's lecture and other plenary and invited lectures presented at the Linz conference were published in the December 1991 issue of *PAC*. They included an invited lecture presented by IUPAC affiliate Hitoshi Ohtaki (Institute for Molecular Science, Okazaki, Japan) on 'Nucleation processes of NaCl and CsF crystals from aqueous solutions studied by molecular dynamics simulations.'

In the preface to this issue of *PAC*, Gerhard Gritzner (Chairman of the Local Organizing Committee) reported that 161 scientists from 30 countries representing the five continents participated in this conference. The six plenary lectures covered such different areas in solution chemistry as supramolecular chemistry, solvation and reactivity, solvent effects on electrode reactions, solution chemistry at surfaces, calorimetry in pure and mixed solvents and new considerations about the solvent water. Invited lectures dealt with computational methods in solution chemistry, with molecular dynamics at the platinum–water interface, with the dissolution and nucleation of alkali halides in water and with the solvation of fluoride ions in different solvents.

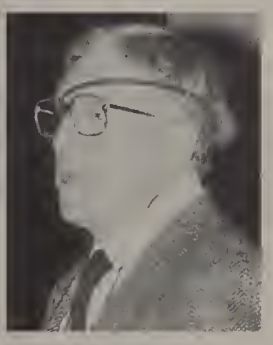
A total of 68 contributed papers and 45 posters reflected the broad range of activities in aqueous, mixed and non-aqueous solvents. Topics covered included theoretical

modelling and Monte-Carlo simulations of multicomponent electrolytes, structure determinations of solutions by X-ray and neutron diffraction, thermodynamic, kinetic, spectroscopic and electrochemical measurements, solvatochromic studies, solvation phenomena, single-ion transfer poperties, conductivity, complex formation especially by macrocyclic compounds, liquid–vapour and liquid–solid equilibria, hydrogen bonding and data banks for electrolyte properties.

Calorimetry and chemical thermodynamics

Leo Brewer (Lawrence Berkeley Laboratory, University of California, USA) presented a plenary lecture on 'Chemical thermodynamics in the future development of chemistry including environmental problems' at the International Symposium on Calorimetry and Chemical Thermodynamics held in Moscow, Russia, on 23–27 June 1991.

Brewer, who is an IUPAC affiliate, pointed out that high-temperature science will be facing unusual challenges in the decade ahead. New technological advances are requiring new materials with unusual properties that will either be prepared by high-temperature techniques or will need to have long-term stability at high temperatures in various environments.



Leo Brewer (right) presented a lecture on 'Chemical thermodynamics in the future development of chemistry including environmental problems'. *(Below: WHO photo A. Kochar.)*

One of the major driving forces for new materials arises from the increasing public concern about environmental pollution. Equipment using volatile fluids that can survive up to the stratosphere and destroy the ozone will have to be replaced. Brewer added that processes that emit sulfur oxides will have to be modified to reduce sulfur emission to very low values.

The efficiency of solar energy devices will have to be improved and nuclear power plants will have to be designed to make serious accidents extremely unlikely so that energy production by combustion to carbon dioxide is greatly reduced.

According to Brewer, many other examples can be given of the need for new materials. The possible combinations of the elements are enormous. The problems cannot be solved by trial-and-error procedures. Practical predictive models must be developed to narrow down the range of materials that might have the desired products. Brewer discussed examples of possible models.

Brewer's lecture and the following four plenary lectures were all published in the January 1992 issue of *PAC* :

- The Luginin thermochemical laboratory of the Moscow State University (Victor P. Kolesov, Moscow, Russia).
- Thermodynamic study of ice and clathrate hydrates (Hiroshi Suga, Takasuke Matsuo and Osamu Yamamuro, Osaka University, Japan).
- Thermodynamics of high-temperature superconducting materials (Gennadij F. Voronin, Moscow, Russia)
- Databases: past, present and future (Donala D. Wagman, Bethesda, USA).

In addition, 11 invited lectures were published in the January issue of the journal. These included a paper on 'Fluorine combustion calorimetry: progress in recent years and possibilities of further development' co-authored by Vladimir Ya. Leonidov (Moscow, Russia) and P. A. G. O'Hare (NIST, Gaithersburg, USA). O'Hare is Chairman of the Commission on Thermodynamics and an IUPAC affiliate. Inorganic Chemistry Division President Kurt Komarek presented an invited lecture on 'Experimental techniques in high temperature thermodynamics.'

Biotechnological processes

Three plenary lectures presented at the 33rd IUPAC Congress held in Budapest, Hungary, in August 1991, and six 'Recent reports' were published in the February 1992 issue of *PAC*.

One of the lectures, by Karl Schügerl (Universität Hannover, Germany), is entitled 'New trends in measurement and control of biotechnological processes'. In the paper, Schügerl points out that to improve biotechnological production processes, improved on-line analysis techniques and better process control are necessary.

His review reports mainly on recent developments in on-line techniques, such as on-line aseptic sampling, on-line continuous flow analysis, on-line flow injection analysis, on-line HPLC, and on-line mass spectrometry. He also takes into account the determination of the concentration and biological state of the cells as well as the necessity for sophisticated control.

Budapest: three of the Congress lectures have been published in *PAC*.

The two other papers are 'Morphology of polymers' by A. Keller (Bristol, UK) and 'New challenges in electrochemistry and electroanalyis' by IUPAC President Allen Bard (see *CI*, Vol. 14, No. 2, p. 51, 1992).

In pursuit of accuracy

The International Congress of Analytical Sciences was held in Makuhari-Messi, Chiba, Japan, on 25–31 August 1991. The plenary and keynote lectures presented at the congress were published in the April 1992 issue of *PAC*.

The first of these, entitled 'In pursuit of accuracy: Nomenclature, assumptions, and standards', was presented by Dr Lloyd Currie (National Institute of Standards and Technology, Gaithersburg, USA).

In the abstract to the paper, Currie, who is a Titular Member of IUPAC Commission on General Aspects of Analytical Chemistry, points out that accuracy is the central measure of quality in analytical science. In the paper, he reviews three topics essential for the pursuit of accuracy, especially in the exposure and reduction of the 'big' errors in analytical measurements.

The first topic is analytical nomenclature. This, states Currie, lies at the heart of any effort to realize and communicate the nature and level of accuracy of the Chemical Measurement Process (CMP). His discussion centres on the historic role of IUPAC in this endeavour and he considers some outstanding problems in analytical nomenclature, particularly those related to detection and identification.

The second topic comprises assumptions and standards (materials and data) that are crucial in the search for major errors and in the control of accuracy, both within and between laboratories. Standard (Certified) Reference Materials have long been central to this effort, but more recently they have been joined by Standard Test Data. The latter datasets have known characteristics and are designed to simulate the structure of complex analytical signals. They show great promise for the control of quality in the computational phase of the CMP.

The final topic relates to revolutions in analytical measurement science that can make the most profound impact on accuracy: revolutions in sampling, measurement, and computation. Two illustrations are presented: (1) accelerator mass spectrometry, a fundamentlly new approach to atomic and isotopic mass spectrometry that makes possible the direct measurement of element and isotope ratios as small as 10^{-16}, and (2) exploratory statistical graphics, a data visualization tool that permits analytical scientists to apply directly their intuitive 'vision' to the assessment of multivariate data quality, and to search for unsuspected relationships in complex chemical datasets.

Monitoring the global environment

The second Chiba congress paper published in this issue of *PAC* is 'Monitoring of the global environment–Participation of Japan and other Asian countries.' The paper is by Prof. Keiichiro Fuwa (The University of Tokyo, Tokyo) who, until 1991, was a Member of the IUPAC Analytical Chemistry Division Committee.

Fuwa points out that global environmental issues are some of the most urgent problems facing the world today, not only in the field of science but also at the international social and political levels. Examples mentioned by Fuwa in the abstract to the paper are CFCs which have been found to deplete the ozone in the stratosphere which covers the whole earth and protects the biosphere. Anthropogenic greenhouse gases such as CO_2, CH_4, and N_2O, are increasing gradually in the troposphere leading to global warming and a changing climate. Acid rain, marine pollution, deforestation and desertification are also global issues.

In his paper, Fuwa presents some of the specific environmental problems of Japan and other countries. In particular, he points out that growing economic development in this large region of the world may result in increasing emissions of pollutants such as SO_x, NO_x and CO_2. However, large areas of forest still remain and these can contribute to the protection of the environment since they are a sink for CO_2 and preserve precious biota.

Other congress papers published in the April *PAC* are:

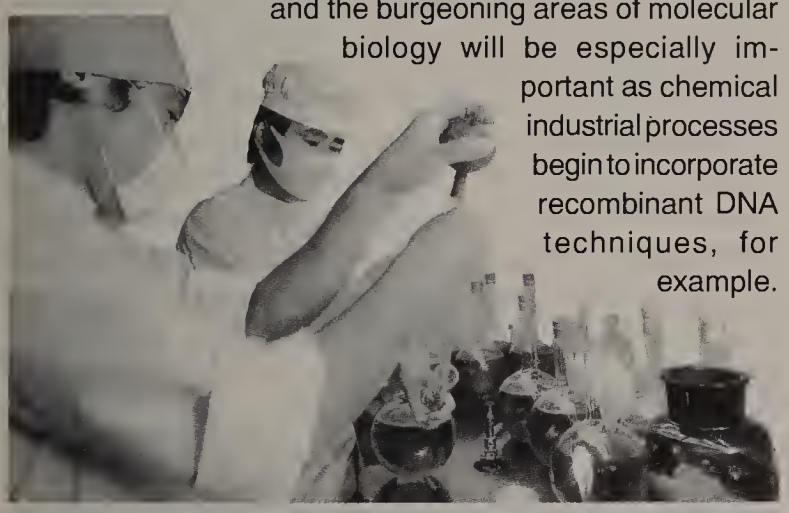
- Solid-state mass spectrometry for materials science (M. Grasserbauer).
- Fuzzy logic and neural networks–applications to analytical chemistry (Matthias Otto, Tatjana George, Claudia Schierle and Wolfhard Wegscheider).
- Working mechanism of ion-selective electrodes (Erno Pungor).
- Monolayer surface structure analysis (G. A. Somorjai and U. Starke).
- Chlorofluorocarbons in the atmosphere: trends and vertical profiles (Takeshi Tominaga).
- High-sensitive protein sequence analysis (Brigitte Wittmann-Liebold).

Analytical nomenclature lies at the heart of any effort to realize and communicate the nature and level of accuracy of the chemical measurement process.

Glossary for chemists of terms used in biotechnology (IUPAC Recommendations 1992)

The glossary contains definitions and explanatory notes, if needed, of over 230 terms frequently used in publications in the multidisciplinary field of biotechnology.

The glossary was developed as a step to help facilitate communication between chemists, chemical engineers, biologists and bioengineers and to make biotechnology and its methodologies more accessible to the chemical profession. The interrelation between chemistry, chemical engineering and the burgeoning areas of molecular biology will be especially important as chemical industrial processes begin to incorporate recombinant DNA techniques, for example.



A new IUPAC glossary will help facilitate communication between chemists, chemical engineers, biologists and bioengineers.

The range of terms includes microbiology, genetic engineering, biochemistry, molecular biology, biochemical engineering, bioprocessing and general concepts of biotechnology.

This report was prepared for publication by B. Nagel, H. Dellweg and L. M. Gierasch, Commission on Biotechnology, Applied Chemistry Division, and published in PAC, *Vol. 64, No. 1, pp. 143–168, 1992.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 12, No. 4, p. 148, 1990. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of February 1991 were taken into consideration when preparing the final report.*

Interrelations of chemistry and biotechnology – III. Purification techniques for biological products (Technical Report)

The purification of a biological product, e.g. an antibiotic, a vitamin, or a recombinant protein, from fermentation broth or cell culture supernatant is an important part of biotechnological manufacturing. Downstream recovery represents a large part of the product cost and therefore efficient and robust separation techniques are essential for the production of biological products. Recovering a biological product from the contaminants and impurities requires a series of purification steps, each removing some of the impurities and bringing the product closer to the final specifications.

The demand for improved purification techniques has increased over the past decade, following the successful molecular cloning and expression of recombinant proteins for research, diagnostic or therapeutic applications. In response to this demand, research activity in downstream processing has increased. In this review some new and innovative methods for purification of recombinant proteins will be discussed.

This report was prepared for publication by Erich Hochuli, Commission on Biotechnology, Applied Chemistry Division and published in PAC, *Vol. 64, No. 1, pp. 169–184, 1992.*

Present and future status of organic analytical reagents – Part IV. Organic analytical reagents in atomic absorption spectrophotometry of metals (Technical Report)

The effects of frequently used organic analytical reagents (OARs) in flame and electrothermal atomic absorption spectrophotometry (AAS) are surveyed. The sensitivity and selectivity of the AAS determinations of some elements are increased and the matrix effects suppressed or diminished in the presence of appropriate OARs. The mechanisms for the various effects observed with OARs are discussed. Examples are given of the beneficial use of OARs in both flame and electrothermal AAS.

This report was prepared for publication by L. Sommer, J. Komarek and D. Thorburn Burns, Commission on General Aspects of Analytical Chemistry, Analytical Chemistry Division and published in PAC, *Vol. 64, No. 2, pp. 213–226, 1992.*

A critical survey of hydride generation techniques in atomic spectroscopy (Technical Report)

Formation of the hydrides of antimony, arsenic, bismuth, germanium, lead, selenium, tellurium and tin by reaction with sodium tetrahydroborate(III) affords an excellent method for the separation of these elements as gases from a wide range of matrices.

Excellent low limits of detection are attained when this separation method is combined with atomization of the

hydride in a heated quartz tube in the optical axis of a conventional atomic absorption spectrometer but there are many interferences to contend with both at the hydride generation stage and in the atomization process. Hydride generation is also used in conjunction with ICP emission spectrometers. It is particularly useful for the determination of arsenic and selenium which suffer considerable spectral interferences caused by radicals in flame AAS.

Implications of recent advances in the application of this separation procedure for the determination of hydride forming elements by atomic absorption and also ICP atomic emission spectrographic techniques are discussed.

This report was prepared for publication by A. D. Campbell, Commission on Microchemical Techniques and Trace Analysis, Analytical Chemistry Division and published in PAC, *Vol. 64, No. 2, pp. 227-244, 1992.*

Preparation of biological samples for ion microscopy (Technical Report)

Ion microscopy is a powerful technique for intracellular elemental localization in biological specimens. The effective use of this technique depends on the reliability of sample preparation. An ideal sample preparation should preserve the chemical and structural integrity of a living cell, and it should also satisfy the instrumental requirements for analysis.

This article critically reviews different methods of sample preparation for diffusible element analysis in soft biological tissues and cultured cells. Frozen freeze-dried tissue cryosections mounted on a smooth conducting substrate provide reliable specimens for ion microscopic analysis. For tissue culture cells, a cryo freeze-fracture–freeze-dry method can be used for diffusible element localization and ion transport studies.

Ion images of physiologically important diffusible elements such as Ca, K and Na are included to show their intracellular distribution in tissue sections and cultured cells. Typical sample preparation artifacts are also discussed.

This report was prepared for publication by Subhash Chandra, Earl W. Sod, Walter A. Ausserer and George H. Morrison, Subcommittee on Surface Analysis, Commission on Microchemical Techniques and Trace Analysis, Analytical Chemistry Division and published in PAC, *Vol. 64, No. 2, pp. 245–252, 1992.*

Nomenclature, symbols, units and their usage in spectrochemical analysis – XII. Terms related to electrothermal atomization (IUPAC Recommendations 1992)

Terminology for electrothermal atomization is recommended and its use illustrated mainly in the application of electrothermal atomization to atomic absorption spec-trometry. The terms, symbols and abbreviations required for the description of atomizers, for the processes involved in electrothermal atomization and in their analytical use are prescribed. An index of terms is included.

This report was prepared for publication by T. A. M. Ure, L. R. P. Butler, B. V. L'Vov, I Rubeska and R. Sturgeon, Commission on Spectrochemical and Other Optical Procedures for Analysis, Analytical Chemistry Division, and published in PAC, *Vol. 64, No. 2, pp. 253–259, 1992.*

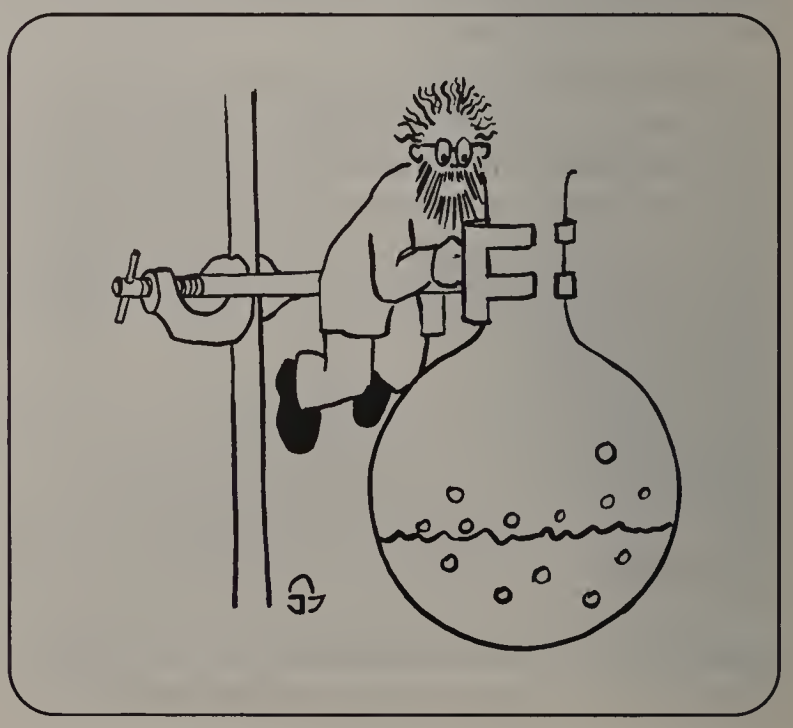
A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 12, No. 6, p. 227, 1990. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of June 1991 were taken into consideration when preparing the final report.*

Nomenclature, symbols, units and their usage in spectrochemical analysis – XIII. Terms related to chemical vapour generation (IUPAC Recommendations 1992)

The terms required for the description of chemical vapour generating systems and processes used for the introduction of sample material in optical atomic spectrometry are prescribed. The terms include those relevant to the generation of volatile halides, mercury vapour and the halogens for determination by such spectrochemical techniques. The terminology recommended embraces the gas flow systems involved and the sampling and excitation sources use, in particular, with hydride generation techniques. An index of terms is included.

This report was prepared for publication by T. A. M. Ure, L. R. P. Butler, B. V. L'Vov, I Rubeska and R. Sturgeon, Commission on Spectrochemical and Other Optical Procedures for Analysis, Analytical Chemistry Division, and published in PAC, *Vol. 64, No. 2, pp. 261–264, 1992.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 12, No. 6, p. 229, 1990. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of June 1991 were taken into consideration when preparing the final report.*



Critical compilation of physical properties of short-lived intermediates: carbenes and carbene analogues (Technical Report)

A critical compilation is presented of physicochemical parameters of carbenes (unstable derivatives of two-coordinated carbon) and their analogues, such as silylenes, germylenes, and stannylenes. Experimental data evaluated is from the following methods: pulsed methods of generation and spectral registration; low-temperature matrix spectra IR, UV, ESR, etc.; gas phase methods of molecular studies, such as mass-microwave- and photo-electron spectroscopy and gas electronography; and high-level computational techniques.

This report was prepared for publication by O. M. Nefedev, M. P. Egorov, A. I. Ioffe, L. G. Menchikov, P. S. Zuev, V. I. Minkin, B. Ya. Simkin and M. N. Glukhovtsev, Commission on Physical Organic Chemistry, Organic Chemistry Division, and published in PAC, *Vol. 64, No. 2, pp. 265–314, 1992.*

Determination of the phospholipid profile of lecithins by high-performance liquid chromatography: results of a collaborative study and the standardized method (Technical Report)

An HPLC method was tested for the direct determination of phosphatidylethanolamine (PE), phosphatidic acid (PA), phosphatidylinositol (PI), and phosphatidylcholine (PC) in commercial soybean lecithin concentrates. The CV_r for PC ranged from 0.7 to 7.0 and the CV_R for PC was 7.3 in the two years of the study.

This report was prepared for publication by J. L. Beare-Rogers, A. Bonekamp-Nasner and A Dieffenbacher, Commission on Oils, Fats and Derivatives, Applied Chemistry Division, and published in PAC, *Vol. 64, No. 3, pp. 447–454, 1992.*

Preparation and certification of ion-implanted reference materials: a critical review (Technical Report)

The preparation and certification of ion-implanted reference materials is critically evaluated and information is provided for the analyst to specify and query conditions of ion implantation and certification. The information consists of (1) discussion of ion implantation generally, of quantitative ion implantation in particular, and of the differences between theoretical, as-implanted, and as-measured depth distributions, and (2) data on sputtering yields, limiting dose densities for quantitative ion implantation, concentrations at the distribution maximum and at the surface, for implantants (analytes) and host materials with atomic numbers between 10 and 80, for implantation energies between 10 and 300 keV. A nomenclature is introduced which provides for the special requirements of certification of ion-implanted reference materials.

This report was prepared for publication by Werner H. Gries, Subcommittee on Surface Analysis, Commission on Microchemical Techniques and Trace Analysis, Analytical Chemistry Division, and published in PAC, *Vol. 64, No. 4, pp. 545–574, 1992.*

Determination of arsenic species in biological and environmental samples (Technical Report)

Identification and quantitative determination methods of arsenic species in environmental and biological samples are discussed. Isolation followed by molecular spectroscopic determination is necessary for rigorous identification while element-specific detections coupled with separation techniques are the choice for quantitative determination. Analytical figures of merit are given for the methods applicable to a specific matrix evaluating hydride generation technique, high-performance liquid chromatography coupled with atomic absorption, ICP atomic emission, ICP mass spectrometric detection, thin layer and gas chromatography with atomic absorption spectrometric detection and other methods. Sample preparation is the area that requires attention as it still represents the main source of problems including matrix interference, incomplete recovery and analyte instability.

This report was prepared for publication by M. Morita and J. S. Edmonds, Working Group on Speciation, Commission on Microchemical Techniques and Trace Analysis, Analytical Chemistry Division, and published in PAC, *Vol. 64, No. 4, pp. 575–590, 1992.*

Laser ionization of sputtered atoms: trace analysis of samples with atomic dimensions (Technical Report)

Many technologically important problems involve trace analysis of samples containing only a few atoms. These problems are particularly difficult because they present the simultaneous requirements of efficient sample utilization (high useful yield) and good discrimination (trace impurities). For many analytical techniques these requirements are mutually exclusive. Recent experimental work using laser ionization of sputtered secondary neutral atoms has demonstrated that this technique can achieve part-per-trillion detection efficiencies with useful yields in excess of 1%. This paper reviews and assesses this new technique.

This report was prepared for publication by M. J. Pellin, Working Group on Organic Trace Analysis, Commission on Microchemical Techniques and Trace Analysis, Analytical Chemistry Division, and published in PAC, *Vol. 64, No. 4, pp. 591–598, 1992.*

Safety in chemical production

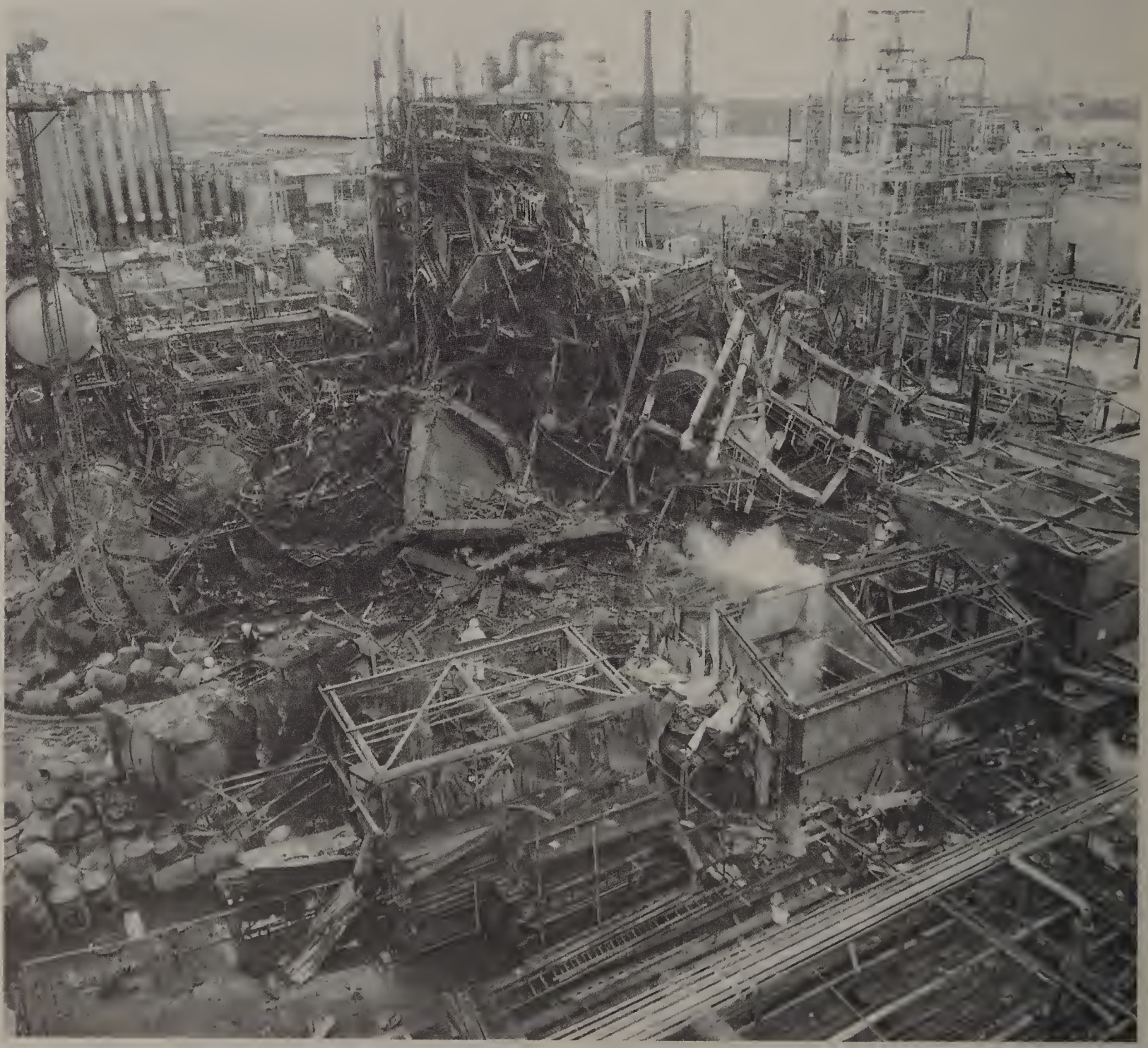
Safety in Chemical Production is the title of the Proceedings of the 1st IUPAC Workshop on Safety in Chemical Production held in Basel, Switzerland, on 9–13 September 1990 (see *CI*, Vol. 13, No. pp. 50–60, 1991).

In his preface to this volume, proceedings editor Jim Whiston (Group Safety Manager, ICI, London, UK) points out that this 1st IUPAC Workshop had its origins in the General Assembly discussion in Lyon in 1985, held at a time when there were significant concerns following the events at Seveso and Bhopal, in particular on the procedures and processes used when safety technology was transferred from the developed to the developing world.

It was also recognised that there were many groups active in the fields of safety education; thus it was essential to identify the additive and distinctive contributions which IUPAC could make to this area.

After detailed dicussion three points were clearly evident:

- IUPAC is the only truly international organization in chemistry.
- IUPAC is independent of both government and industry. It is therefore uniquely placed in bringing academic scientists together with technical personnel from industry and government – this has been one of its many roles during its history.
- IUPAC can influence science teaching in universities and hence the education in safety technology of chemists and chemical engineers.



The damage from a runaway chemical reaction: the workshop included cases on hazard analysis and risk reduction.

Basel was the venue of the 1st IUPAC Workshop on Safety in Chemical Production. Jim Whiston edited the proceedings.

The IUPAC Committee on Chemistry and Industry (COCI) recognized that university teaching in this area was inadequate. Thus if a workshop could be designed which would link together real case studies, especially in the field of hazard analysis and risk reduction, with model lectures based on the case studies for use in universities then a real need would be met.

It was also determined to use an industrial base to demonstrate the link between the university science and its application in industry. Basel was chosen for practical reasons: three multi-national chemical companies are located conveniently near to each other and they agreed to offer facilities to the workshop.

Day 1 of the workshop provided the scientific basis for risk and hazard analysis. The application of these principles is seen in the detailed case studies provided by the Basel chemical industry on day 2. With a scientific base and an appreciation of the practical applications then on day 3 the way in which principles and practices could be brought into a university curriculum was demonstrated including some typical model lectures. Finally, on day 4, views on principles, practices and teaching were collected, key principles established and suggestions made for future development.

The workshop proceedings include not only papers presented but also the 'model' lectures, a bibliography of possible teaching aids as well as two papers which would have been included in day 1 presentations had additional time been available.

Proceedings of the First IUPAC Workshop on Safetey in Chemical Production *is edited by J. Whiston and published by Blackwell Scientific Publications, Oxford, UK, 1991. xi + 281 pp. ISBN 0-632-03255-3. Price: GBP 42.50/ USD 69.50 (Hardback). IUPAC affiliates are entitled to a 25% discount on this price.*

Gases in molten salts

Volume 45/46 of the *Solubility Data Series* contains compiled and critically evaluated solubility data for gases in molten salts using the published literature up to December 1989. The information in this volume has special relevance in some of the technological applications of molten salt systems, including high temperature molten salt batteries and fuel cells, extractive metallurgical processes and energy storage systems. Included in this volume are solubility data for inert gases, the halogens, hydrogen halifes, hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide, nitrogen dioxide, sulfur dioxide, water vapor, ammonia, titanium tetrachloride, methane and chloroform. In addition a special section is devoted to solubilities of gases in molten slag systems. Where there are sufficient experimental solubility data for a given system, the data are critically evaluated and recommended solubilities tabulated along with enthalpies and entropies of solution. Many of the evaluations test Henry's Law and enable one to calculate Henry's constants from it assuming ideal gas behavior.

Volume 45/46 of the Solubility Data Series *entitled* Gases in Molten Salts *is edited by Reginald P. T. Tomkins and Narottam P. Bansal and published by Pergamon Press, Oxford, UK, 1991. xviii + 555 pp. ISBN 0 08 0307353 Price: USD 200.00.*

Alkali metal and ammonium chlorides in water and heavy water (binary systems)

Alkali Metal and Ammonium Chlorides in Water and Heavy Water is Volume 47 of the *Solubility Data Series.* The alkali metal chlorides, especially the chlorides of sodium and potassium, occur so widely in nature, in science and in industrial processes that accurate knowledge of their solubilities is of considerable importance. In this volume, all data from the literature published up to 1983, and also some selected data of importance published as late as 1990, are compiled and evaluated. The data include not only solubilities in the liquid phase, but also vapour pressures and densities of solid-saturated solutions, and (in the few cases where measurements exist) compositions at high temperatures and

Discounts for IUPAC members and affiliates

Members of IUPAC commissions and committees and IUPAC affiliates may purchase volumes of the *Solubility Data Series* at reduced prices:

- USD 35.00 (USD 70.00 for Volume 45/46) for members whose names appear in the *IUPAC Handbook* or for any individual whose institution has a library subscription.
- USD 75.00 (USD 150.00 for Volume 45/46) for IUPAC affiliate members.

Place your orders directly with your nearest Pergamon agency, or use the Pergamon Hotline Service in Oxford, Tel: +44 (865) 743 685.

Prof. Jack Lorimer (left) and Prof. Roger Cohen-Adad are the editors of Volume 47 of the *Solubility Data Series*.

pressures of vapour phases in equilibrium with solid-saturated liquids. All solid phases involved in solubility equilibria, including ice, are considered.

This is the first comprehensive compilation of solubility data for sodium and potassium chlorides since the work of D'Ans in 1933. The amount of data for these systems alone is so large that it was necessary to confine the volume to binary systems. Subsequent volumes will treat multicomponent systems, including seawater.

As with earlier volumes in the series, the compilations present all accessible data in their original form, coverage of the Russian-language literature being especially thorough. Evaluations are given for all systems, along with fitting equations and estimates of reliability. Thus, all of the original data are available in one place to facilitate comparison with new data, and to use with new evaluation procedures as the need arises. A comprehensive preface to the volume discusses methods of evaluation, fitting equations and the general nature of phase equilibria in the systems of interest, and summarizes the invariant points which characterize the systems. The evaluated systems are indexed by IUPAC and *Chemical Abstracts* names. There are also an author index and cross indexes of *Chemical Abstracts* Registry Numbers, names and formulas.

Volume 47 of the Solubility Data Series *entitled* Alkali Metal and Ammonium Chlorides in Water and Heavy Water (Binary Systems) *is edited by R. Cohen-Adad and J. W. Lorimer and published by Pergamon Press, Oxford, UK, 1991. xxx + 533 pp. ISBN 0 08 0239188. Price: USD 100.00.*

Organic chemistry of sulfur

The Proceedings of the 14th International Symposium on the Organic Chemistry of Sulfur, held in Łódź, Poland, on 2–7 September 1990, have been published as a single volume in *Phosphorus, Sulfur, and Silicon and the Related Elements*, Vol. 58/1–4, pp. 1–294, and Vol. 59/1–4, pp. 1–296, (1991). The journal is published by Gordon and Breach Science Publishers. The Conference Editors were Marian Mikołajczyk and Piotr Kiełbasinski. A report by Jan Michalski on the conference appeared in *CI*, Vol. 13, No. 5, pp. 200–201, 1991.

Macromolecular symposia

Polymer networks

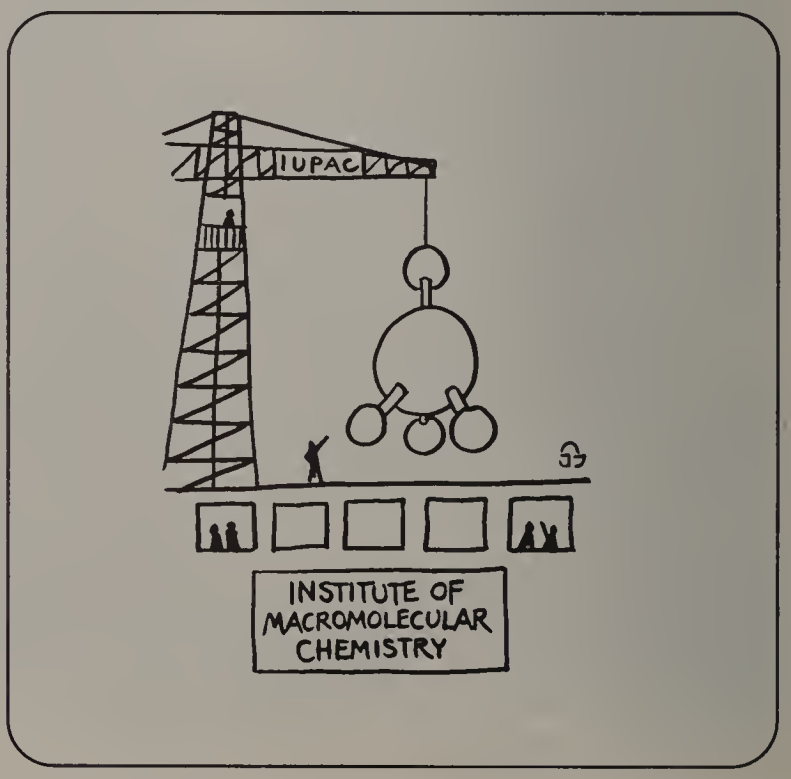
Volume 45 of *Makromol. Chem. Macromol. Symp.* (May 1991) is the second of two volumes of papers from Networks 90: the 10th Polymer Networks Group Meeting and the IUPAC sponsored 10th International Symposium on Polymer Networks, held in Jerusalem, Israel on 20–25 May 1990. The symposium editors are Moshe Gottlieb (Ben Gurion University of the Negev, Israel, and Robert Stepto (Manchester, UK). [*Networks 90*, Volume 1 appeared in *Makromol Chem. Macromol. Symp.,* Vol. 40, pp. 1–235, 1990]

As with the first volume, the contributions in the second volume reflect the breadth of topics covered at the meeting and that of present-day research into polymer networks and the activities of the Polymer Network Group. They have been grouped according to the structure of the conference programme.

Papers 1–18 relate to the formation of networks and the development of properties and structure. In particular, papers 1–6 are concerned with the sol–gel transition and the formation of physical networks, and papers 7–15 with the study and modelling of the formation and properties of covalent networks. Papers 16–21 relate to the properties of networks, emphasizing the behaviour of network chains. Papers 21–25 present studies on diffusion in network materials and membranes and paper 26 is concerned with interpenetrating polymer networks.

Mechanics and kinetics of polymerization reactions

The International Symposium on Mechanisms and Kinetics of Polymerization Reactions, Their Use in Polymer Synthesis (Sympol 90), organized in honour of Professor Pierre Sigwalt on the occasion of his 65th birthday, was held in La Défence Area of Paris, France, on 9–13 September 1990 under the sponsorship of IUPAC, Centre National de la Recherche Scientifique, and Groupe Français des Polymères.



Polymer 91 was held in Melbourne, Australia.

At its title implies, the symposium aimed to cover polymer synthesis reactions, i.e. anionic, cationic, free-radical, Ziegler-natta and other types of polymerizations, polycondensation and various problems related to polymer synthesis.

The symposium attracted 250 participants from 23 countries (65% from abroad). Invited lectures were published in Volume 47 of *Makromol. Chem. Macromol. Symp.* (July 1991). The symposium editors are N. Spassky and H. Sekiguchi (Université Pierre et Marie Curie, Paris, France).

Speciality polymers

Volume 51 of *Makromol. Chem. Macromol. Symp.* (October 1991) is a collection of two plenary lectures and 14 invited lectures delivered at the IUPAC-sponsored International Symposium on Speciality Polymers held in Singapore on 7–9 November 1990. A total of 134 papers was presented by authors from 20 countries. The symposium editor is Prof. L. M. Gan (National University of Singapore).

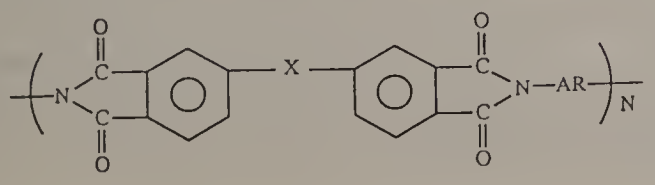
The scientific programme was divided into three main topics:

1. High-performance polymers
2. Functional polymers
3. Electroactive polymers.

The first of the published plenary lectures is entitled 'Macromolecular engineering on the basis of the polymerization of 2-oxazolines' and co-authored by Past-President of the IUPAC Macromolecular Division, Prof. T. Saegusa and Prof. Y. Chujo (both from Kyoto University, Japan).

The second plenary lecture in this volume has the title '"Synthetic metals": A novel role for organic polymers'. The authors are Alan G. MacDiarmid (University of Pennsylvania, USA) and Arthur Epstein (The Ohio State University, Columbus, USA).

Prof. J. E. McGrath presented a paper on 'Synthesis and blend behavior of high-performance homo- and segmented thermoplastic polyimides'. The paper was co-authored by McGrath and four co-workers at Virginia Polytechnic Institute & State University, USA. In the introduction to the paper, the authors point out that polyimides, such as those with the generalized structure shown below have many engineering applications due to their excellent thermal oxidative behaviour and mechanical properties. The aerospace and microelectronics industries have developed many important applications.



Polymer materials

Volume 53 of *Makromol. Chem. Macromol. Symp.* contains invited lectures from the International Symposium on Polymer Materials–Preparation, Characterization and Properties (POLYMER 91) which was held in Melbourne, Australia, on 11–14 February 1991. The symposium was sponsored by IUPAC, the Australian Academy of Science and the Australian Academy of Technological Sciences and Engineering. It was organized by the Polymer Division of the Royal Australian Chemical Institute (RACI).

According to the Chairman of the POLYMER 91 Organizing Committee, Jim O'Donnell (University of Queensland), the diversity of applications of polymer materials is well illustrated in the papers in this issue of *Makromol. Chem. Macromol. Symp.* He writes in the Preface that the sophistication in the design and synthesis of polymer molecules is increasing rapidly. New approaches to the traditional methods of polymerization including free-radical chain-growth, step-growth and emulsion polymerizations, have enabled quantitative modelling of the reactions to high conversion. Newer methods of polymerization, including metathesis and group-transfer, are now being utilized in a wide variety of applications.

Understanding and control of morphology, especially of specialized materials, such as liquid crystals and conducting polymers, and of multi-phase systems, including blends and composites, are enabling significant improvements in material properties. Incorporation of reactive groups by polymerization or subsequent reactions gives functionalized polymers with a wide range of applications. The surfaces of polymer materials are now recognized to be of crucial importance for many applications, and many new spectroscopic techniques, such as ESCA and SIMS, are being utilized for their characterization.

The electronics, information and communication industries provide significant markets for sophisticated polymer materials. Radiation-sensitive resist films for manufacture of integrated circuits is a field of intense research activity producing polymers with extremely specialized properties.

The latest developments include opto-electronic materials for integration of signal transmission along glass-fibre optical cables with digital electronic operations.

Characterization of the architecture of polymer molecules is becoming increasingly dependent on advanced instrumentation and interpretation of complex experiments. NMR (including multi-pulse, two-dimensional, solid-state and imaging techniques) and FTIR spectroscopy now give remarkably detailed structural information on polymer molecules, and fluorescence measurements provide time resolution of processes into the picosecond region.

Bringing chemistry to life

'Bringing chemistry to life' was the central theme of the 11th International Conference on Chemical Education (11th ICCE) which was held at the University of York, UK, on 25–30 August 1991. The scientific programme included 9 plenary lectures, 12 lectures, 20 symposia, 35 workshops and 244 poster presentations as well as six evening lectures.

A small sample of these presentations are published in the December 1991 issue of *International Newsletter on Chemical Education* (No. 36). The first is by Susan Adamson (Poynton County High School, UK) who drew on her classroom experience to give an insight into 'New perspectives in chemical education.' Wobbe de Vos and colleagues from the University of Utrecht, the Netherlands, co-authored a paper on 'The hidden structure in school chemistry and how to escape from it.'

A paper by Alex Johnstone (University of Glasgow, UK) on 'Thinking about thinking' quotes Ogden Nash: 'It is possible to make progress in the wrong direction'. Johnstone is referring to chemistry teaching and asks if we have paid too much attention to the *chemical* part of chemical education and not enough to the *education* part.

Others papers published in this issue of INCE are:

- Strategies for training chemistry teachers
  (L. R. Summerlin, University of Alabama, USA).
- Chemistry and brain disease
  (G. P. Reynolds, University of Sheffield, UK).
- Liquid crystals and their applications
  (G. W. Gray, Merck Ltd, Poole, UK).
- Ozone: friend or foe?
  (M. J. Pilling, University of Leeds, UK).
- Education for global responsibility
  (W. S. Fyfe, University of Western Ontario, Canada).

Chemical exposure limits

The International Labour Office (ILO) in Geneva has recently published a compilation of exposure limits of chemical substances in workplace air for 2129 substances in 15 countries. The title is *Occupational Exposure Limits for Airborne Toxic Substances* (3rd edn, 1991). (ISBN 92-2-107293-2/ISSN 0078-3129. Price CHF 47.50; USD 38.00; GBP 20.90.) The publication is No. 37 in the ILO Occupational Safety and Health Series. The compilation is also available as a microcomputer database from ILO's International Occupational Safety and Health Information Centre (CIS).

Prevention of major industrial accidents

The ILO has also published a code of practice on *Prevention of Major Industrial Accidents* (1991). (ISBN 92-2-107101-4. Price CHF 20.00; USD 16.00; GBP 8.80.) The publication provides guidance in setting up an administrative, legal and technical system for the control of installations producing, storing or using hazardous substances. It covers siting, analysis of risks, prevention, safe operation, emergency planning, and the duties and responsibilities of all those involved.

Further information on these and other ILO publications may be obtained from: (1) ILO Publications, International Labour Office, CH-1211 Geneva 22, Switzerland. Tel: +41 (22) 799 6111. Fax: +41 (22) 798 6358. Telex: 415747 ilo ch. (2) International Labour Office, Vincent House, Vincent Square, London SW1P 2NB. Tel: +44 (71) 828 6401. Fax: +44 (71) 233 5925.

Biochemical nomenclature

The International Union of Biochemistry (IUB) has been renamed the International Union of Biochemistry and Molecular Biology (IUBMB). The following are extracts from Newsletter 1992 published by the IUBMB Nomenclature Committee (NC-IUBMB) and the IUPAC-IUBMB Joint Commission on Biochemical Nomenclature (JCBN).

Pronunciation of pregn-4-ene

In the recently published recommendations on steroid nomenclature, the locant of a double bond is always inserted directly in front of the syllable(s) -ene, -diene, etc. This change results in a problem in the pronunciation of the names of compounds with one double bond when the parent has a consonant that is normally pronounced as part of the ending -ane. In particular, pregnane and estrane pose this problem. To aid pronunciation, an additional 'a' is often inserted in speech, e.g. pregn(a)-4-ene. The 'a' in parentheses is used only for pronunciation and should not be used in the written form. Similarly, estr-4-ene is pronounced as estr(a)-4-ene.

This proposal is an extension of the existing form used for steroids with more than one double bond, e.g. pregna-4,6-diene.

Ligands in biochemistry and inorganic chemistry

The definition of 'ligand' approved by chemists is: 'If it is possible to indicate a 'central' atom in a polyatomic molecular entity, the atoms or groups bound to that atom are called ligands. The term is generally used in connection with metallic 'central' atoms.'

NC-IUBMB believes that the wider biochemical usage is covered by changing the first sentence italicizing the words that change the meaning to read: 'If it is possible or *convenient* to regard *part of* a polyatomic molecular entity as central, then the atoms, groups *or molecules* bound to that part are called ligands.'

Biochemical usage is thus wider, in that the central entity can be polyatomic. Thus H^+ may be a ligand for proteins and for citrate as well as for O_2^-. It may even be a ligand for a univalent entity such as acetate: in other circumstances, AcO^- may be the ligand for H^+, since the definition makes clear that the view of which entity is central may change for convenience. Thus four calcium ions are ligands for calmodulin, when the protein is regarded as central; four carboxylate groups of calmodulin ligate (are ligands of) each calcium ion when this ion is regarded as central. It is the ligand that is said to ligate the central entity, which is said to be ligated.

When the hormone binding to a receptor is called a ligand, the receptor is thus regarded as the central entity.

Biochemists should bear in mind that the usage in inorganic chemistry has been that ligands bind only single atoms, so they should be cautious in fields such as bioinorganic chemistry where confusion may be possible.

Numbering of steroid-side-chain atoms

Additional alkyl substituents attached to a steroid skeleton are numbered using the locant of the attachment position and a superscript number indicating the number of atoms from the attachment position and a superscript number indicating the number of atoms from the attachment position. Now that the numbers 28, 29 and 30 are assigned to the additional methyl groups at C-4 and C-14 in triterpenoids, such as lanosterol, the additional carbon atoms at C-24 of ergostane, campestane, poriferastane, stigmastane and gorgostane are also numbered using a superscript number, i.e. 24^1, 24^2. When it is necessary to identify these atoms in naming a steroid using one of these parents the appropriate locant is used. For example, fecosterol is 5α-ergosta-8,24(24^1)-dien-3β-ol [formerly 5α-ergosta-8,24(28)-dien-3β-ol]. It may alternatively be called 24-methylene-5α-cholest-8-en-3β-ol. In all other cases the use of a locant modified by a superscript number is intended for identification purposes, e.g. ^{13}C-nmr, and not as a basis for further substitution. For example, oxymethalone (an international non-proprietary name) is 17β-hydroxy-2-(hydroxymethyl-ene)-17α-methyl-5α-androstan-3-one, not 2^1, 17β-dihydroxy-17α-methyl-2-methylene-5α-androstan-3-one.

Current activities

The nomenclature committees of IUBMB are currently addressing the following topics:

1. Nomenclature of glycolipids: to update the glycolipids section of the Recommendations 1976 on the nomenclature of lipids;
2. Nomenclature of carbohydrates: to update the Tentative rules 1969 for carbohydrate nomenclature, Part 1 and various subsequent documents on unsaturated and branched chain monosaccharides, and polysaccharides;
3. Nomenclature of lignans and neolignans: a new document;
4. Prostaglandins and thromboxanes, leukotrienes and related compounds: a new document

Biochemists interested in commenting upon these documents when available for general discussion are invited to write to any member of the committees or to their secretary.

Plans for future activities

Protein nomenclature

The nomenclature of proteins is an outstanding example of a problem that is in need of solution but which has seen little or no progress towards a solution during the many years of existence of the successive nomenclature committees of IUBMB. At first sight the EC system of classification of enzymes might seem to provide a way of naming proteins, if coupled with the established nomenclature of amino acids and peptides. Unfortunately, however, it does not, because the EC system names functions, not structures: a name like superoxide dismutase, for example, may refer to two or more entirely different chemical structures with little in common beyond the fact that they catalyse the same reaction; conversely, a single molecule may appear in *Enzyme Nomenclature* under two or more different and non-equivalent names, such as homoserine dehydrogenase and aspartokinase, if it catalyses more than one reaction.

Thus one cannot use an enzyme name as the name of a chemical structure unless it is qualified in some way. In any case, there are many non-enzyme proteins, such as receptors, hormones, structural proteins, etc., that are in just as much need of systematic nomenclature as enzymes.

Although the NC-IUBMB has been unable to progress significantly with this problem and sees little prospect of being able to do so in the near future, it would be unduly pessimistic to conclude that systematic naming of protein structures cannot be done. Biochemists are accordingly invited to suggest – by writing to any member of the nomenclature committees or to their secretary – systems that they believe might prove generally applicable.

Enzyme nomenclature

The new edition of *Enzyme Nomenclature* will appear in 1992. It will be the last one prepared by E. C. Webb. Subsequent editions will be coordinated by K. F. Tipton, Biochemistry Department, Trinity College, Dublin 2, Ireland.

One way of continuing would be to create a working group for each class of enzymes: dehydrogenases and oxidases (could be subdivided), oxygenases, methyltransferases, acyltransferases, glycosyltransferases, phosphokinases, esterases and lipases, glycosidases, phosphatases, peptidases, lyases, isomerases, and ligases.

Suggestions for group convener and panel members for each group of enzymes are welcome and should be sent to K. F. Tipton or to any member of the committees.

Other fields of interest

The nomenclature committees of IUBMB believe that the following fields should be covered in the future by new documents or revision of existing documents. They wish to know if this opinion is shared by the biochemical community. They welcome comments and suggestions for names of possible convenors and of members of the future panels.

The fields are: phycobiliproteins, junctions in nucleic acids, protein kinases and phosphatases, phosphorus-containing compounds, neurotransmitters and their analogues, and cyclic peptides.

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin:*

July 1991 issue of *ISO Bulletin*:

TC17	**Steel**
ISO 10280:1991	Steel and iron – Determination of titanium content. Diantipyrylmethane spectrometric method
TC 45	**Rubber and rubber products**
ISO 6502:1991	Rubber – Measurement of vulcanization characteristics with rotorless curemeters
TC 48	**Laboratory glassware and related apparatus**
ISO 695:1991	Glass – Resistance to attack by a boiling aqueous solution of mixed alkali - Method of test and classification
TC 54	**Essential oils**
ISO 9843:1991	Oil of cedarwood (*Cupressus funebris* Endlicher)
TC 61	**Plastics**
ISO 9353:1991	Glass-reinforced plastics – Preparation of plates with unidirectional reinforcements by bag moulding
ISO 9988-2:1991	Plastics – Polyoxymethylene (POM) moulding and extrusion materials – Part 2: Preparation of test specimens and determination of properties
ISO 10082:1991	Plastics – Phenolic resins – Definitions and test methods
TC 134	**Fertilizers and soil conditioners**
ISO 8358:1991	Solid fertilizers – Preparation of samples for chemical and physical analysis
ISO 8634:1991	Solid fertilizers – Sampling plan for the evaluation of a large delivery
TC 138	**Plastics pipes, fittings and valves for the transport of fluids**
ISO 4435:1991	Unplasticized poly(vinyl chloride) (PVC-U) pipes and fittings for buried drainage and sewerage systems - Specifications
ISO 7675:1991	Chlorinated poly(vinyl chloride) (PVC-C) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings - Specifications
ISO 7682:1991	Acrylonitrile/butadiene/styrene (ABS) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings - Specifications
ISO 8283-1:1991	Plastics pipes and fittings - Dimensions of sockets and spigots for discharge systems inside buildings - Part 1: Unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C)
ISO 8772:1991	High-density polyethylene (PE-HD) pipes and fittings for buried drainage and sewerage - Specifications
ISO 8773:1991	Polypropylene (PP) pipes and fittings for buried drainage and sewerage - Specifications
TC 147	**Water quality**
ISO 5667-5:1991	Water quality - Sampling - Part 5: Guidance on sampling of drinking water and water used for food and beverage processing
ISO 5667-6:1991	Water quality - Sampling - Part 6: Guidance on sampling of rivers and streams

August 1991 issue of *ISO Bulletin*:

TC 34	**Agricultural food products**
ISO 4150:1991	Green coffee - Size analysis - Manual sieving
ISO 5524:1991	Tomatoes - Guide to cold storage and refrigerated transport
ISO 6668:1991	Green coffee - Preparation of samples for use in sensory analysis
ISO 7908:1991	Dried sweet cherries - Specification
TC 45	**Rubber and rubber products**
ISO 2453:1991	Rubber, raw styrene-butadiene, emulsion-polymerized - Determination of bound styrene content - Refractive index method
ISO 2929:1991	Rubber hoses for bulk fuel truck delivery - Specification
ISO 4641:1991	Rubber hoses for water suction and discharge - Specification
TC 48	**Laboratory glassware and related apparatus**
ISO 3585:1991	Borosilicate glass 3.3 - Properties
TC 54	**Essential oils**
ISO 8899:1991	Oil of lemon (*Petitgrain itrus limon* (L.) N. L. Burman)
ISO 9842:1991	Oil of rose (*Rosa damascena* P. Miller)
TC 138	**Plastics pipes, fittings and valves for the transport of fluids**
ISO 3633:1991	Unplasticized poly(vinyl chloride) (PVC-U) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings - Specifications
ISO 7671:1991	Polypropylene (PP) pipes and fittings (jointed by means of elastomeric sealing rings) for soil and waste discharge (low and high temperature) systems inside buildings - Specifications
ISO 8770:1991	High-density polyethylene (PE-HD) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings - Specifications
ISO 9853:1991	Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings for pressure pipe systems - Crushing test
TC 176	**Quality management and quality assurance**
ISO 9000-3:1991	Quality management and quality assurance standards - Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software

September 1991 issue of *ISO Bulletin*:

TC 6	**Paper, board and pulps**
ISO 535:1991	Paper and board - Determination of water absorptiveness - Cobb method
TC 33	**Refractories**
ISO 10081-1:1991	Basic refractory products - Classification - Part 1: Products containing less than 7% residual carbon
TC 34	**Agricultural food products**
ISO 1740:1991	Milk fat products and butter - Determination of fat acidity (Reference method)
ISO 9289:1991	Oilseed residues - Determination of free residual hexane
TC 61	**Plastics**
ISO 1873-1:1991	Plastics - Polypropylene (PP) and propylene-copolymer thermoplastics - Part 1: Designation
ISO 2559:1991	Textile glass - Mats (made from chopped or continuous strands) - Basis for a specification
ISO 8515:1991	Textile-glass-reinforced plastics - Determination of compressive properties in the direction parallel to the plane of lamination
TC 126	**Tobacco and tobacco products**
ISO 3402:1991	Tobacco and tobacco products - Atmosphere for conditioning and testing
TC 138	**Plastics pipes, fittings and valves for the transport of fluids**
ISO 8572:1991	Pipes and fittings made of glass-reinforced thermosetting plastics (GRP) - Definitions of terms relating to pressure, including relationships between them, and terms for installation and jointing
ISO/TR 10837:1991	Determination of the thermal stability of polyethylene (PE) for use in gas pipes and fittings
TC 147	**Water quality**
ISO 5667-2:1991	Water quality - Sampling - Part 2: Guidance on sampling techniques

TC 156	**Corrosion of metals and alloys**
ISO 8407:1991	Corrosion of metals and alloys - Removal of corrosion products from corrosion test specimens
TC 176	**Quality management and quality assurance**
ISO 9004-2:1991	Quality management and quality system elements - Part 2: Guidelines for services

October 1991 issue of *ISO Bulletin*:

TC 54	**Essential oils**
ISO 9841:1991	Oil of Hyssop (*Hyssopus officinalis* L.)
TC 61	**Plastics**
ISO 8570:1991	Plastics - Film and sheeting - Determination of cold-crack temperature
TC 91	**Surface active agents**
ISO 4317:1991	Surace active agents and detergents - Determination of water content - Karl Fischer method
TC 126	**Tobacco and tobacco products**
ISO 8451:1991	Tobacco - Determination of starch content - Enzymatic method
ISO 10315:1991	Cigarettes - Determination of nicotine in smoke condensates - Gas-chromatographic method
TC 146	**Air quality**
ISO 9486:1991	Workplace air - Determination of vaporous chlorinated hydrocarbons - Charcoal tube/solvent desorption/gas-chromatographic method
ISO 9487:1991	Workplace air - Determination of vaporous aromatic hydrocarbons - Charcoal tube/solvent desorption/gas chromatographic method

November 1991 issue of *ISO Bulletin*:

TC 34	**Agricultural food products**
ISO 3972:1991	Sensory analysis -Methodology - Method of investigating sensitivity of taste
ISO 6321:1991	Animal and vegetable fats and oils - Determination of melting point in open capillary tubes (slip point)
ISO 9233:1991	Cheese and cheese rind - Determination of natamycin content - Method by molecular absorption spectrometry and by high-performance liquid chromatography
TC 35	**Paints and varnishes**
ISO/TR 9038:1991	Paints and varnishes - Determination of the ability of liquid paints to sustain combustion
TC 91	**Surface active agents**
ISO 1065:1991	Non-ionic surface-active agents obtained from ethylene oxide and mixed non-ionic surface-active agents - Determination of cloud point
TC 126	**Tobacco and tobacco products**
ISO 10362-1:1991	Cigarettes - Determination of water in smoke condensates - Part 1: Gas-chromatographic method
TC 129	**Aluminium ores**
ISO 6138:1991	Aluminium ores - Experimental determination of the heterogeneity of constitution
ISO 10226:1991	Aluminium ores - Experimental methods for checking the bias of sampling
TC 138	**Plastics pipes, fittings and valves for the transport of fluids**
ISO 8361-1:1991	Thermoplastics pipes and fittings - Water absorption - Part 1: General test method
ISO 8361-2:1991	Thermoplastics pipes and fittings - Water absorption - Part 2: Test conditions for unplasticized poly(vinylchloride) (PVC-U) pipes and fittings
ISO 8361-3:	Thermoplastics pipes and fittings - Water absorption - Part 3: Test conditions for acrylonitrile/butadiene/styrene (ABS) pipes andfittings
TC 174	**Jewellery**
ISO 9202:1991	Jewellery - Fineness of precious metal alloys
TC 176	**Quality management and quality assurance**
ISO 9000-3:1991	Quality management and quality assurance standards - Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software

December 1991 issue of *ISO Bulletin*:

TC 17	**Steel**
ISO/TR 9769:1991	Steel and iron - Review of available methods of analysis
TC 34	**Agricultural food products**
ISO 5555:1991	Animal and vegetable fats and oils - Sampling
TC 35	**Paints and varnishes**
ISO/TR 8502-1:1991	Preparation of steel substrates before application of paints and related products - Tests for the assessment of surface cleanliness - Part 1: Field test for soluble iron corrosion products
TC 45	**Rubber and rubber products**
ISO 248:1991	Rubbers, raw - Determination of volatile-matter content
ISO 815:1991	Rubber, vulcanized or thermoplastic - Determination of compression set at ambient elevated or low temperatures
ISO 2411:1991	Rubber- or plastics-coated fabrics - Determination of coating adhesion
ISO 4023:1991	Rubber hoses for steam - Test methods
ISO 5435:1991	Rubber compounding ingredients - Carbon black - Determination of tinting strength
ISO 6101-1:1991	Rubber - Determination of metal content by atomic absorption spectrometry - Part 1: Determination of zinc content
ISO 7725:1991	Rubber and rubber products - Determination of bromine and chlorine content - Oxygen flask combustion technique
TC 54	**Essential oils**
ISO 8897:1991	Oil of juniper berry (*Juniperus communis* L.)
ISO 9844:1991	Oil of bitter orange (*Citrus aurantium* ssp. *aurantium* L.)
TC 59	**Building construction**
ISO 10590:1991	Building construction - Sealants - Determination of adhesion/cohesion properties at maintained extension after immersion in water
ISO 10591:1991	Building construction - Sealants - Determination of adhesion/cohesion properties after immersion in water
TC 61	**Plastics**
ISO 10352:1991	Fibre-reinforced plastics - Moulding compounds and prepregs - Determination of mass per unit area
TC 85	**Nuclear energy**
ISO 9404-1:1991	Enclosures for protection against ionizing radiation - Lead shielding units for 150-mm-, 200-mm- and 250-mm-thick walls - Part 1: Chevron units of 150 mm and 200 mm thickness
TC 102	**Iron ores**
ISO 9684:1991	Iron ores - Determination of vanadium content - Flame atomic absorption spectrometric methods
ISO 9685:1991	Iron ores - Determination of nickel and/or chromium contents - Flame atomic absorption spectrometric method
ISO 9685:1991	Iron ores - Determination of nickel and/or chromium contents - Flame atomic absorption spectrometric method
TC 107	**Metallic and other inorganic coatings**
ISO 8403:1991	Metallic coatings - Coatings anodic to the substrate - Rating of test specimens subjected to corrosion tests
TC 147	**Water quality**
ISO 9888:1991	Water quality - Evaluation of the aerobic biodegradability of organic compounds in an aqueous - Static test (Zahn–Wellens method)
ISO 9998:1991	Water quality - Practices for evaluating and controlling microbiological colony count media used in waterquality tests
ISO 10048:1991	Water quality - Determination of nitrogen - Catalytic digestion after reduction with Devarda's alloy
TC 156	**Corrosion of metals and alloys**
ISO 10062:1991	Corrosion tests in artificial atmosphere at very low concentrations of polluting gas(es)

January 1992 issue of *ISO Bulletin*

TC 28	**Petroleum products and lubricants**
ISO 91-2:1991	Petroleum measurement tables - Part 2: Tables based on a reference temperature of 20°C
ISO 6578:1991	Refrigerated hydrocarbon liquids - Static measurement - Calculation procedure
ISO 8310:1991	Refrigerated light hydrocarbon fluids - Measurement of temperature in tanks containing liquefied gases - Thermocouple and resistance thermometers
ISO 8943:1991	Refrigerated light hydrocarbon fluids - Sampling of liquefield natural gas - Continuous method
TC 34	**Agricultural food products**
ISO 1842:1991	Fruits and vegetables products - Determination of pH
ISO 8292:1991	Animal and vegetable fats and oils - Determination of solid fat content - Pulsed nuclear magnetic resonance method
ISO 10399:1991	Sensory analysis - Methodology - Duo-trio test
TC 45	**Rubber and rubber products**
ISO 812:1991	Rubber, vulcanized - Determination of low-temperature brittleness
ISO 2007:1991	Rubber, vulcanized - Determination of plasticity - Rapid-plastimeter method
ISO 3384:1991	Rubber - vulcanized or thermoplastic - Determination of stress relaxation in compression at ambient and at elevated temperatures
ISO 3862:1991	Rubber hoses and hose assemblies - Rubber-covered, spiral wire reinforced, hydraulic type - Specification
ISO 3949:1991	Plastic hoses and hose assemblies - Thermoplastics, textile-reinforced, hydraulic type - Specification
ISO 4080:1991	Rubber and plastics hoses and hose assemblies - Determination of permeability to gas
ISO 4097:1991	Rubber, ethylene-propylene-diene (EPDM) - General purposes types - Evaluation procedure
ISO 6915:1991	Flexible cellular polymeric materials - Polyurethane foam for laminate use - Specification
ISO 6945:1991	Rubber hoses - Determination of abrasion resistance of the outer cover
ISO 7233:1991	Rubber and plastics hoses and hose assemblies - Determination of suction resistance
ISO 7751:1991	Rubber and plastics hoses assemblies - Ratios of proof and burst pressure to design working pressure
ISO 9026:1991	Raw rubber or unvulcanized compounds - Determination of green strength
ISO 10066:1991	Flexible cellular polymeric materials - Determination of creep in compression
TC 102	**Iron ores**
ISO 9682-1:1991	Iron ores - Determination of manganese content - Part 1: Flame atomic absorption spectrometric method
ISO 9683:1991	Iron ores - Determination of vanadium content - BPHA spectrophotometric method
TC 107	**Metallic and other inorganic coatings**
ISO 2063:1991	Metallic and other inorganic coatings - Thermal spraying - Zinc, aluminium and their alloys
ISO 6370-1:1991	Vitreous and porcelain enamels - Determination of the resistance to abrasion - Part 1: Abrasion testing apparatus
TC 126	**Tobacco and tobacco products**
ISO 3401:1991	Cigarettes - Determination of alkaloid retention by the filters - Spectrometric method
TC 129	**Aluminium ores**
ISO 6140:1991	Aluminium ores - Preparation of samples
TC 134	**Fertilizers and soil conditioners**
ISO/TR 5307:1991	Solid fertilizers - Derivation of a sampling plan for the evaluation of a large delivery

We regret to record the death of

Dr V. Chvalovský, Czechoslovakia (3 December 1991) - Chairman of Czechoslovak National Committee for Chemistry (1988–91)

Safeguarding water quality

A number of International Standards on water quality, prepared by ISO/TC 147's sub-committees 1, 6 and 7, have recently been published as drafts.

Three new parts to ISO/DIS 5667, Water Quality – Sampling, prepared by SC 6 are: Part 8, Guidance on the sampling of wet deposition; Part 10, Guidance on sampling of wastewaters; and Part 11, Guidance on sampling of groundwaters. They are intended to be read in conjunction with the first three parts of ISO 5667, which dealt with general guidance on the design of sampling programmes, sampling techniques and on the preservation and handling of samples. Other parts of ISO 5667 give guidance on sampling of natural and man-made lakes (Part 4), of drinking water and water for food and beverage processing (Part 5), of rivers and streams (Part 6), of water and stream in boiler plants (Part 7), and of marine waters (Part 9).

Water Quality – Vocabulary (Part 8 from SC1) is an addition to the previous seven parts of ISO 6107 already published. The definitions in this vocabulary have been formulated to standardize terminology to describe water quality. Terms included may be the same as in vocabularies published by other international organizations, but the definitions may differ because they have been drafted with different objectives in mind.

ISO/DIS 8466 Part 2 from SC 7 relates to Water quality – Calibration and evaluation of analytical methods and estimation of performance characteristics – Calibration strategy for non linear second order calibration functions. It is not always possible to describe accurately the relationship between a set of calibration points with a rectinlinear curve, even by decreasing the working range. Instead of the linear regression analysis a polynomial of the second order is applied. Using this, one can calculate not only the calculation function but also the confidence interval associated with it. This standard is intended primarily for use in method development and may not necessarily be applicable to all routine analysis.

ISO/DIS 8466 Part 3, Water quality – Calibration and evaluation of analytical methods and estimation of performance characteristics – Method of standard evaluation, relates to three different fields of application.

- detection of proportional systematic errors;
- test for matrix effects;
- establishing the actual limit of detection.

A number of analytical methods show proportional systematic errors caused by matrix interferences. These errors can be identified and eliminated by application of the method of standard addition. This draft International Standard describes the method of standard addition and illustrates it by means of examples.

Identification of wheat varieties by electrophoresis

A very important contribution to international food technology has been made by ISO in its series of standards on cereals, pulses and derived products, these include specifications and analysis of wheat and wheat flour. The latest of these is

Wheat: an ISO International Standard on the identification of varieties of wheat by electrophoresis is at an advanced stage.

now in the advanced stage of draft International Standard, ISO/DIS 8981, Wheat – Identification of varieties by electrophoresis.

The protein composition of wheat results from direct genetic control and in general is not affected by environmental conditions such as location or year of growth. In addition, because wheat is essentially a self-pollinating plant, the protein composition of the different varieties remains stable for several plant generations, so that protein composition can be used to identify the variety.

ISO/DIS 8981 proposes a practice which has been thoroughly characterized and is in common use in numerous countries. It makes visible the separated protein components, and the resulting profiles can be established for all wheat varieties which can be expected to occur in a particular region, including the identification of an unknown variety through compilation of a variety catalogue.

Reference materials

ISO Guide 30, *Terms and Definitions Used in Connection with Reference Materials* has been revised and copies are available from national standards organizations. The main changes concern the definitions of **reference material** and **certified reference material**, which are now more rigorously defined than in the first edition of the guide. IUPAC is represented on the ISO Council Committee which prepared the revised guide (ISO/REMCO) and recommends producers and users of reference materials to use the terms therein only as now defined. ISO/REMCO is the Committee on Reference Materials of the International Organization for Standardization.

SCOPE Newsletter

SCOPE is the Scientific Committee on Problems of the Environment of the International Council of Scientific Unions (ICSU). The November 1991 issue of *SCOPE Newsletter* (No. 38) provides details of SCOPE Membership 1991 (35 member countries and academies).

The issue includes a report by Christine Shoemaker (Cornell University, USA) on a Workshop on Groundwater Contamination held in Chiang-Mai, Thailand in June 1991. There is also a report by Alicja Breymeyer (Institute of Geography & Spatial Organization, Warsaw, Poland) on a Workshop on Geography of Organic Matter Budgets in Terrestrial Eco-systems held at the Szymbark Field Station in Poland.

Other items include an overview by Alexey G. Ryaboshpako (Moscow) of efforts in Russia on 'Biogeochemical Cycles' and a description of the IUBS–SCOPE–UNESCO International Collaborative Research Programme on Biodiversity by Talal Younes, Executive Director of IUBS (International Union of Biological Sciences).

The SCOPE Secretariat is located at ICSU Headquarters: 51, boulevard de Montmorency, 75016 Paris, France. Tel: +33 (1) 45 25 04 98. Telex: 645544 F ICSU. Fax: 33 (1) 42 88 14 66. E. mail omnet SCOPE.PARIS.

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairmen and secretaries and IUPAC officers were published in the November 1991 issue of *CI* (Vol. 13, No. 6, pp. 223–233). The IUPAC Secretariat has been notified recently of the following changes:

Dr S. R. Heller (Chairman, Committee on Chemical Databases). Tel: +1 (301) 507 6055.

Mr M Lauritzen (Secretary, Clinical Chemistry Division Commission on Quantities and Units). Nov Nordisk A/S, Produktionsvej 8, DK-2600 Glostrup, Denmark. Tel: + 45 (44) 490 033. Fax: +45 (44) 530 161.

Prof. K. V. Sané (Chairman, Committee on Teaching of Chemistry). Fax: +91 (11) 292 1161.

CHEMRAWN VII–The World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change–was held in Baltimore, USA, on 2–6 December 1991. Following discussions at the conference, the CHEMRAWN VII Future Actions Committee published its findings and recommendations.

The World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change was the 7th in the series of IUPAC sponsored conferences devoted to Chemical Research Applied to World Needs (CHEMRAWN). CHEMRAWN VII was held in Baltimore, Maryland, USA on 2–6 December 1991. It was co-sponsored by the American Chemical Society in association with the National Academy of Sciences and the Third World Academy of Sciences.

The scientific programme of CHEMRAWN VII was outlined on pages 197–199 of the September 1991 issue of *Chemistry International*. During the conference, the CHEMRAWN VII Future Actions Committee met and circulated draft findings and recommendations to participants for discussion. The following is a substantial portion of the committee's final published document.

Baltimore.

Introduction

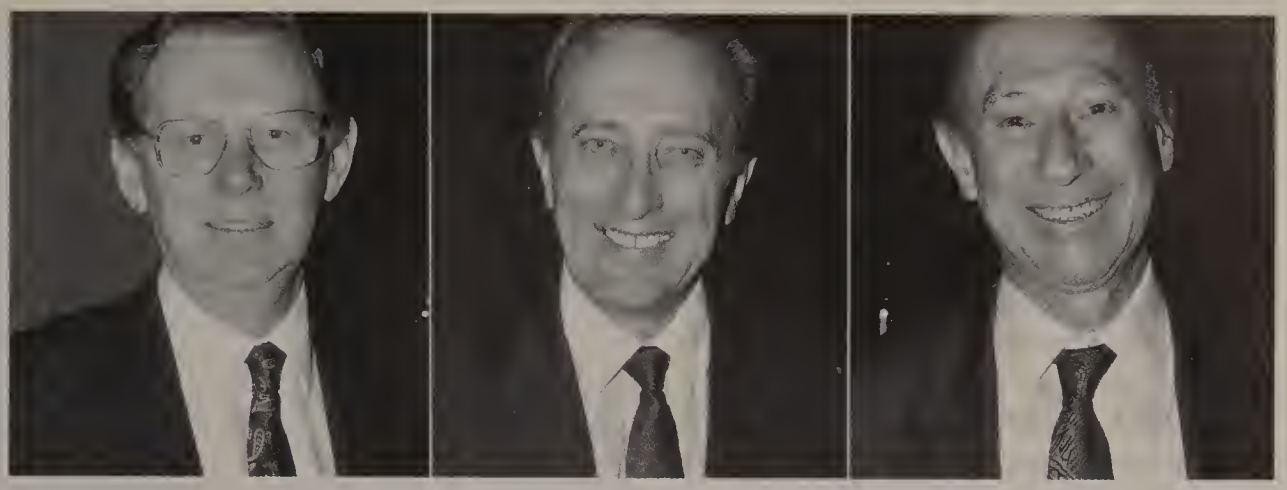
No place remains on Earth where human activity has not had an impact – if not directly through deforestation, cultivation of land, damming of rivers, and urbanization, then indirectly through inadvertent modification of the chemical composition of the atmosphere. Driven by an unprecedented expansion of both the human population and its activities, these changes are now occurring on a global scale and still increasing in magnitude. Because global changes may ultimately affect the habitability of Earth, they have important implications – for the future well-being of humanity. Perhaps more than any other component of the Earth system, the atmosphere is a common resource, shared by all human societies and intimately involved in many life processes.

Over Antarctica, the continent least directly affected by human activities, an 'ozone hole' now develops every spring with depletions of the ozone column exceeding 50%. The scientific evidence clearly implicates industrial and consumer releases of chlorofluorocarbons (CFCs) as its cause. Ozone depletion over midlatitudes has been detected at a rate of 0.2–0.8%/year for reasons that are only partially understood, while the Arctic appears to be chemically poised for even large ozone depletions. These ozone depletions in the stratosphere allow increased levels of biologically damaging ultraviolet radiation to reach the Earth's surface.

In the lower atmosphere, pollutants such as hydrocarbons, oxides of nitrogen and sulfur dioxide have resulted in elevated concentrations of strong oxidants such as ozone and the deposition of strong acids such as nitric and sulfuric acids. These photochemical products, oxidants and acids, are much more damaging to crops and ecosystems than are the primary pollutants they are derived from. As fossil fuel use has increased, atmospheric oxidants and acidity have increased, not only in urban areas, but in rural areas as well.

An ever increasing burden of greenhouse gases resulting from human activities is accumulating in the atmosphere. The buildup of carbon dioxide arises chiefly from the combustion of fossil fuels; that of other gases from various activities including agriculture. These increases are predicted, based on our current understanding of the climate system, to result in a significant global warming within several decades if these emissions continue unchecked. The resultant climate change could cause losses of land to sea level rise, serious dislocations in world food production, and widespread damage to natural ecosystems, including accelerated reductions in biodiversity and ecosystem services. The more rapid the accumulation of greenhouse gases in the atmosphere, the more disruptive their effects are likely to be, and the more difficult it will be for societies to adjust.

Given the interconnected nature of the Earth–atmosphere–ocean system and human dependence upon it, anthropogenic changes on a global scale require adequate responses from the world's scientific, technological, economic, and political communities. In the forthcoming United Nations Conference on the Environment and Development (UNCED), Heads of State and governments will discuss the challenges and opportunities connected with environmental crises and conceivable pathways leading to sustainable development of our civilization. In preparation for this conference, the International Council of Scientific Unions (ICSU) organized a special conference, ASCEND-21 (November 1991), devoted to the Agenda of Science for Environment and Development in the 21st Century (AGENDA-21).



From left: Alan Hayes (Vice Chairman, CHEMRAWN Committee; Bob Sievers (General Chairperson, Organizing Committee); and Rudy Pariser (Vice Chairperson, Organizing Committee and CHEMRAWN Committee).

Through the International Geosphere-Biosphere Program (IGBP) and World Climate Research Program (WCRP), organized by ICSU and the World Meteorological Organization (WMO) and operating within corresponding national programs, the world scientific community is already cooperating in global change research. Global aspects of atmospheric pollution and its consequences are fundamental topics for such programs as the International Global Atmospheric Chemistry Program (IGAC), which is one of the core projects of IGBP. In order to stimulate further efforts in understanding changes in the composition of the atmosphere induced by anthropogenic emissions and to provide more accurate projections of future states of the atmosphere, (IUPAC) initiated the CHEMRAWN VII Conference.

Even though our understanding of atmospheric chemistry today, as presented in the scientific talks and poster sessions of the CHEMRAWN VII Conference, is incomplete, enough is known to justify serious concern and attention from the world community. In the case of stratospheric ozone depletion, indiscriminate human activity has already caused massive damage to the atmosphere; regulation of the chemical emissions responsible has come too late. Although projections of climate change resulting from releases of greenhouse gases are still uncertain, the possible consequences are sufficiently serious that actions are called for now. Considering the large inertia and delayed response of the climate system, we cannot wait, as was done in the case of ozone depletion, until a clear signal of climate change has been detected. Damage to crops, forests and lakes by a combination of atmospheric oxidants and acid precipitation, resulting from fossil fuel combustion, is well documented, and reduction in fossil fuel consumption would reduce these stresses on the environment as well. Lasting solutions to these global problems will require sustained multidisciplinary efforts by the community of nations.

Recommendations

Based on the current understanding of atmospheric chemistry, as summarized in this conference, and on the expertise of its individual members, the Future Actions Committee makes the following recommendations:

With respect to all aspects of global change chemistry

1. Recognize that all atmospheric problems are interrelated and connected with biospheric processes so that an integrated, multidisciplinary approach must be taken for their solution.
2. No major experiments aimed at mitigating global change, that have regional or global consequences, should be undertaken without first securing broad international agreement.
3. Research and develop the means for full social environmental costing of energy use.
4. Develop ecological balance sheets (life cycle analyses) for comparison of different processes leading to similar end products.
5. Apply incentives/disincentives to direct the huge innovative potential of public and, especially, private R&D organizations for the development of more energy-efficient industrial processes and more productive, but sustainable, land use.
6. Provide incentives/disincentives and accelerate development of alternative energy technologies, especially solar and safe nuclear, subject to strict environmental safeguards.
7. Encourage corporations to continue the trend toward increased participation of environmental scientists in decision-making positions.
8. Forge a partnership between governments, industry and academia in establishing global change research priorities and programs and in formulating responsible policy.

Participants at CHEMRAWN VII and (right) discussion of perspectives and recommendations.

With respect to education

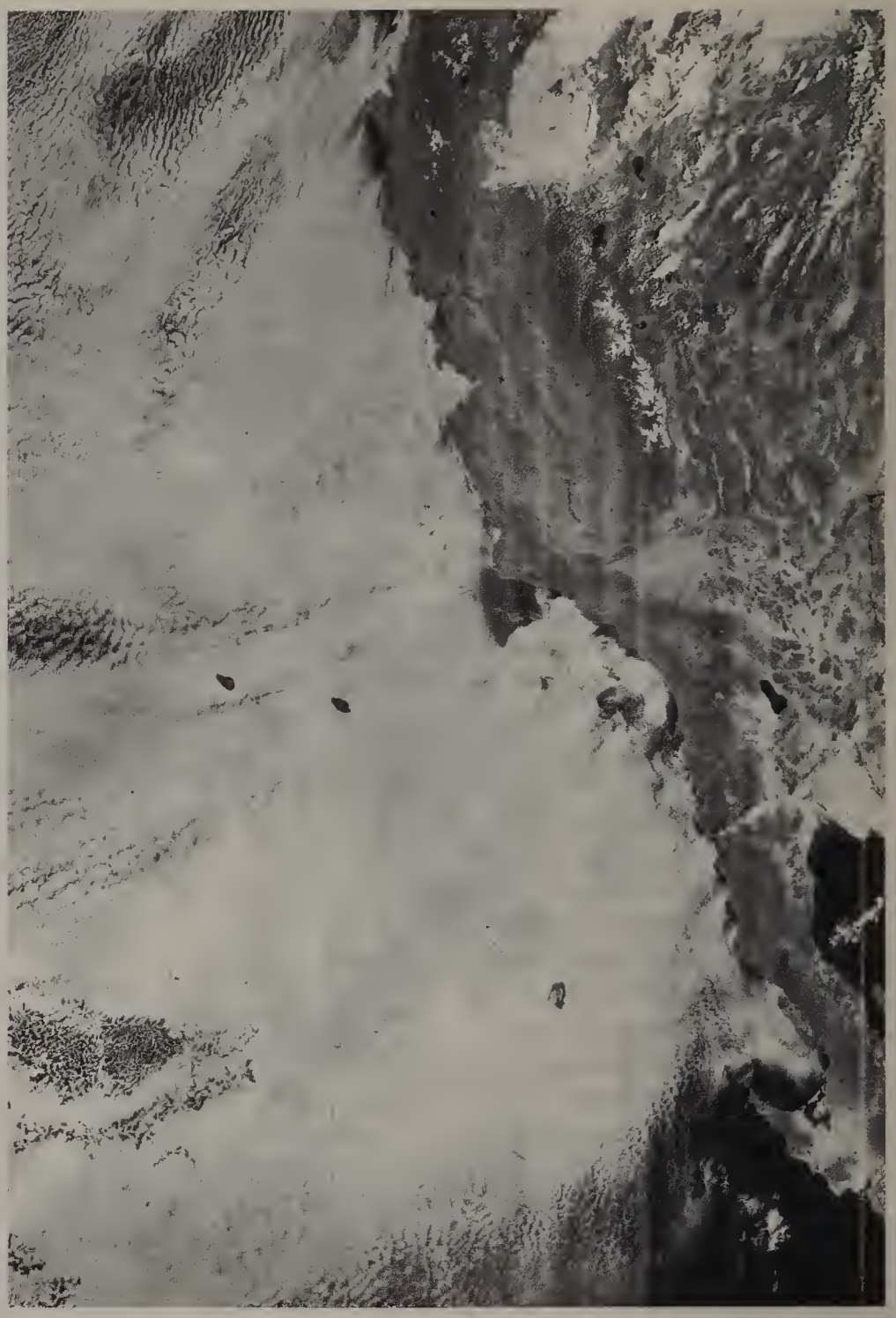
9. Foster the education and professional development of atmospheric chemists world-wide, especially in developing countries.
10. Increase environmental literacy by encouraging environmental chemistry instruction as an important part of general education at all levels (elementary school through university).
11. Improve understanding of global change issues at the political level so that due account is taken of them in policy making.
12. Transfer experience and skills in atmospheric chemistry and monitoring techniques to developing countries through a continuing program of training workshops such as the one held in conjunction with the CHEMRAWN VII conference.

With respect to global monitoring

13. Implement means of establishing adequate quality control in atmospheric measurements worldwide.
14. Encourage government and industry to cooperate with the atmospheric chemistry community in developing global inventories of emissions to the atmosphere.
15. Explore with industry the possibility of strengthening and expanding the existing international efforts to establish a high-quality global monitoring network in developing countries.
    Such networks would enhance our understanding of atmospheric chemistry and global change by:
    a. Establishing chemical sources and deposition patterns for acid precipitation.
    b. Obtaining trends and variability of tropospheric ozone.
    c. Characterizing the global distribution of carbon monoxide and the oxides of nitrogen.
16. Monitor UV radiation and its effects on living organisms and their ecosystems, especially in the vicinity of the Antarctic.
17. Accelerate the development of both research and routine monitoring instruments.

With respect to stratospheric ozone depletion

18. Maintain a vigorous scientific research agenda.
19. Continue high priority attention to developing new substitutes and replacements for CFCs and encourage increased emphasis on recycling and recovery of CFCs, HCFCs, HFCs and bromine-containing compounds.
20. Be advised that proposed new fleets of supersonic aircraft could result in large changes in stratospheric ozone concentrations and climate.



Stratocumulus cloud deck off Baja California as sensed by satellite. Understanding clouds and cloud chemistry is increasingly crucial to predicting possible climate change.

With respect to climate change

21. Promote international discussion and agreement about controlling future emissions of greenhouse gases.
22. Obtain a detailed understanding of the global carbon cycle.
23. Identify and quantify the sources and sinks of greenhouse gases and aerosols.
24. Assign high priority to understanding and quantifying the many feedbacks involved in climate change.
25. Quantify the effects of aerosols on climate, including both direct radiative effects and changes they induce in cloud albedo via their role as cloud condensation nuclei.
26. Utilize available proxy records of climate change (e.g. tree rings, ocean and lake sediments, ice cores, pollen records) to obtain a better understanding of the causes of climate change in the past and to validate climate models.

IUPAC affiliates at CHEMRAWN VII: Kathleen Taylor (General Motors Research Laboratories, USA) was one of the Chairpersons for the session on Tropospheric Build-up of Oxidations. (Right) Tom Graedel (AT&TBell Laboratories, USA) lectured on 'Effects of emissions to the atmosphere on materials and cultural artifacts'. He was Poster Committee Chairperson.

With respect to oxidant formation and acid precipitation in the troposhere:

27. Establish regional networks for the early detection of "cleaner" air resulting from emissions control strategies.
28. Elucidate how local emissions influence regional- and global-scale chemistry.
29. Encourage research to achieve better understanding of acidification processes, including dry deposition, in natural ecosystems and their interactions with other human influences.
30. Strongly enhance research efforts to increase scientific knowledge of tropical atmospheric chemistry, including biotic interactions.

Stratospheric ozone

In the stratosphere, oxygen molecules are photodissociated by absorption of ultraviolet light from the sun to produce oxygen atoms, which combine with other oxygen molecules to form ozone. This formation of stratospheric ozone cannot be affected by human activity. Its destruction, being catalysed by the oxides of hydrogen, nitrogen, chlorine, and bromine, is, however, enhanced by various human activities that increase the concentrations of these ozone-destroying gases above natural levels, resulting in ozone depletion.

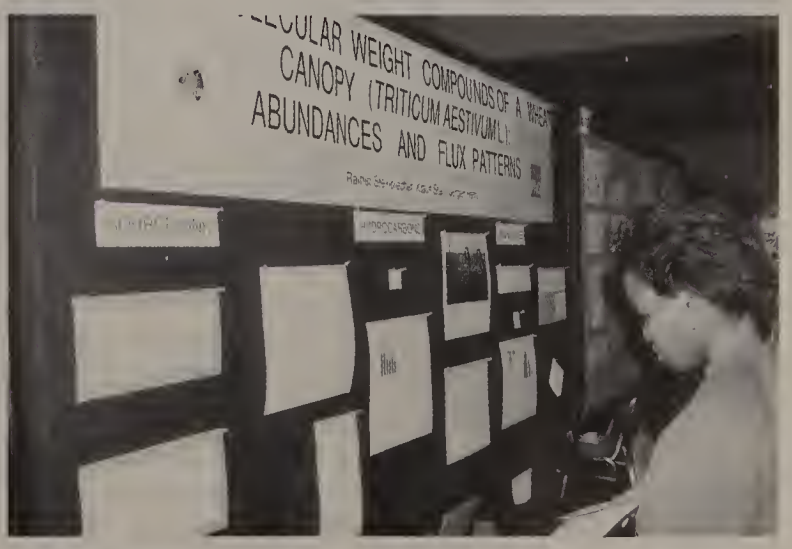
The concentration of ozone in the stratosphere is quite small; its mixing ratio does not exceed 10 parts-per million by volume anywhere in the stratosphere, and, if brought to standard pressure and temperature would only be a 3-mm-thick shell of gas enveloping the Earth. Aside from some light scattering by clouds and aerosol particles, ozone provides the only significant shield for the biosphere against ultraviolet radiation in the wavelength region beginning at 242 nm (the cutoff for shielding by oxygen) and extending to approximately 320 nm. Even in its natural state, the stratospheric ozone layer is an imperfect shield against wavelengths of light in the biologically damaging UV-B region, defined as 280-320 nm, with many species of plants and animals already being stressed by exposure to the amount of UV-B that leaks through. Hence, there is the concern for any reduction in the integrity of the ozone layer.

The ozone distribution in the stratosphere is highly variable, being produced mostly near the equator and transported poleward. The ozone column is actually about two times larger at the poles, where until recently there have been few reactions to destroy it, than at the equator where it is both rapidly produced and destroyed. Large natural variabilities in ozone concentrations make trends difficult to detect. However, the recent observation of an "ozone hole" that forms every spring over Antarctica with as much as 95% or more ozone loss at some altitudes and more than 50% loss in the ozone column has been linked to the accumulation of CFCs in the atmosphere. These CFCs are most likely also responsible for a recently detected 0.2–0.8%/year downward trend in ozone at midlatitudes as well.

Preliminary action on the issue of ozone depletion by CFCs has already been taken at the international level via the Montreal Protocol (1987) and London Amendments (1990). Such action establishes a precedent for international cooperation to limit the release to the atmosphere of pollutants having global consequences. Unfortunately, this action came only after the formation of the "ozone hole" over Antarctica. The CFCs already released to the atmosphere are expected to continue to cause large Antarctic ozone losses well into the next century, and recent measurements indicate that stratospheric ozone in the Arctic and even at midlatitudes is now at risk.

Climate change

Carbon dioxide, water vapor, and other trace gases absorb infrared radiation emitted from the surface of the Earth, thereby trapping some of this radiation and preventing it from escaping to space, with the result that our planet is some 33°C warmer than it would otherwise be. Without this 'greenhouse effect' the Earth would be a frozen planet. Ice core data going back approximately 160 000 years tell us that the Earth has at times been warmer and at other times much colder, with a very high correlation between temperature and the atmospheric concentration of carbon dioxide. Through fossil fuel combustion and deforestation, we are currently increasing the atmospheric burden of carbon dioxide. The atmospheric concentration of carbon dioxide has increased from a pre-industrial value of 280 ppmv to more than 350 ppmv today and is increasing at a rate of 0.5%/year.



Poster session.

Besides carbon dioxide, other greenhouse gases, including methane, nitrous oxide, CFCs, and tropospheric ozone, appear to be increasing at rates such that their cumulative contribution to greenhouse warming is expected to approximately match that of carbon dioxide. General circulation models predict an average increase in global temperature in the range 1.5–4.5°C for a doubling of carbon dioxide (or its equivalent), to be realized sometime in the middle of the 21st century. Such a rapid change in the Earth's climate could have far reaching effects. Sea level rise resulting from thermal expansion of water and melting of polar ice caps could results in flooding of lowlands where much of the human population is concentrated, and melting of permafrost could result in releases of methane gas, thereby amplifying the global warming effect. Changes in local temperatures and rainfall would most likely result in large shifts in agriculturally favorable climate zones, which may or may not be matched with appropriate soils. In many regions, the process of desertification might be intensified. A massive increase in loss of biodiversity and ecosystem disruption is possible as many species may be unable to adapt or migrate at a sufficient pace.

Predictions of climate change resulting from changes in the atmospheric content of greenhouse gases and aerosols rely on computer models of the climate system, usually of the type referred to as General Circulation Models (GCMs). These models attempt to quantify our understanding of the Earth's complex climate system. The models are, of course, only as good as the physics, chemistry and biology that they include. In recent years, chemistry and biology have been found to play increasingly important roles in climate processes. Clearly, GCMs must be improved if accurate predictions of climate change are to be made. As atmospheric chemists, we emphasize in our recommendations improvements in understanding of fundamental chemical processes that must be incorporated in climate models.

The greenhouse gases that have already accumulated in the atmosphere are principally due to past burning of fossil fuels by the now-industrialized nations, and these nations continue to be responsible for a vastly disproportionate fraction of greenhouse gas emissions. The US and European Community, for example, account for only 4.6% and 6.4% of the Earth's population, respectively, but currently contribute 21% and 14% of the greenhouse gas warming potential. Stabilization of the atmospheric content of greenhouse gases will require the cooperation of both industrialized and developing countries.

Oxidant formation/acid precipitation

In the troposphere hydrocarbons and oxides of nitrogen, of both natural and anthropogenic origin, undergo photochemical reactions with the ultraviolet component of sunlight to form strong oxidants. Of these, ozone, hydrogen peroxide, and particularly the hydroxyl radical play important roles in determining the lifetime of various chemical species released to the atmosphere. Such species may themselves be natural or anthropogenic and may serve as ozone-depleting agents, greenhouse gases, or precursors to acid rain. Thus, an understanding of the oxidizing properties of the atmosphere is needed for the reliable prediction of atmospheric residence times, which in turn determine the ozone-depleting potentials of CFC substitutes, the global warming potentials of greenhouse gases, and the extent and severity of acid deposition. Surface-level oxidants such as ozone also have adverse effects on human health, crops, and forests.

Surface-level ozone has increased several-fold in most industrialized regions and is often elevated in rural areas as well. There are indications that upper-tropospheric ozone has increased several percent in the Northern Hemisphere over the past few decades, with a qualitative link to human-influenced nitrogen oxides and hydrocarbons, but with poorly

Press conference at CHEMRAWN VII. From left: Paul J.Crutzen (Max Planck Institute, Germany); Mario J. Molina (Massachusetts Institute of Technology, USA); Sherry Rowland (University of California, USA); and Robert C. Worrest (US Environmental Protection Agency).

defined trends and processes. Thus, a reliable predictive capability is lacking for global tropospheric oxidizing efficiency and its impact on both regional and global budgets of trace gases.

Dry and wet deposition of sulfuric and nitric acids have resulted in damage to the ecology of many freshwater lakes and, in combination with atmospheric oxidants, may be a causative factor of forest decline in many regions of the world. Sulfuric acid is derived principally from combustion of sulfur-containing coal, while nitric acid is produced from oxides of nitrogen released to the atmosphere from a variety of combustion sources. Thus, both oxidant formation and acid deposition are directly tied to fossil fuel use. The impacts of these air pollutants on crops and natural ecosystems can be reduced through a combination of abatement technologies that limit emissions from sources such as power generation plants and automobiles and reduction in the use of fossil fuels as an energy source.

Training workshop

In conjunction with CHEMRAWN VII, the Office of Research and Development of the United States Environmental Protection Agency (EPA) arranged a 2-week training workshop on 18–29 November 1991, at the Area Training Center at Rutgers University, New Brunswick, New Jersey.

The workshop was attended by 25 young scientists from 24 countries in Africa, Asia and South America. International travel for these participants was provided by the United Nations Development Program (UNDP). IUPAC affiliate Dr William E. Wilson (Atmospheric Research and Exposure Assessment Laboratory, EPA) organized the workshop. He also served on the CHEMRAWN VII Organizing Committee and presented two papers at the poster sessions.

The workshop was structured around two of EPA's standard training courses: (1) Atmospheric sampling and measurement; (2) Quality assurance for air pollution measurement systems. The material in these courses is applicable to both health-related and global climate pollutants. The workshop courses included discussion of the chemistry of ozone formation and the monitoring of pollutants that affect global climate. The courses were augmented by lectures on stratospheric ozone and global warming, modelling photochemical smog with a personal computer, and passive monitors.

Dr William E. Wilson.

The course on atmospheric sampling included lectures and laboratory work on the design of air-quality surveillance networks, criteria for selecting monitoring sites, the basis for selection of sampling methods and instruments, methods of calibrations, use of flow rate measuring methods for sampling and analysing criteria pollutants.

Laboratory work included measurement and calibration of flow devices, preparation of calibration gas flows via dilution and permeation systems, and calibration of continuous and passive monitoring devices. The course also included work with the high-volume sampler and the dichotomous samples and other types of samplers that separate particles into fine, coarse, and respirable fractions.

The workshop trained the participants in the use of passive concentration monitors, a simple inexpensive technique recently developed by EPA that is especially useful for ozone and may also be applied to sulfur dioxide, nitrous oxide and other gaseous pollutants.

Scientists from several agencies discussed ways for developing countries to participate in research and monitoring related to global warming and stratospheric ozone destruction. The workshop therefore provided an excellent opportunity for young chemists from around the world to interact with experts in the field of atmospheric chemistry.

Following the workshop, the participants attended the CHEMRAWN VII meeting in Baltimore.

All participants at the Training Workshop attended CHEMRAWN VII. They included (from left): Kalumbu Malekani (Zambia); Francisco Mabjaia (Mozambique); Usha Sharma (Nepal); and Anthony Onuchukwu (Nigeria). All 25 workshop participants have now been registered as IUPAC affiliates.

Macrocyclic chemistry
Provo, Utah, USA
9–14 August 1992

IUPAC SPONSORED

The 17th International Symposium on Macrocyclic Chemistry will be held in Provo, Utah, USA from 9 August to 14 August 1992. The conference language will be English. Future symposia will be held in Enschede, The Netherlands (1993); Lawrence, Kansas (1994); and Jerusalem, Israel (1995).

The organizers are Dr Reed M. Izatt (IUPAC affiliate), Dr Jerald S. Bradshaw and Dr John D. Lamb. The symposium is sponsored by IUPAC.

The symposium will consist of a series of invited lectures as well as poster presentations of accepted contributed papers. In addition, several mini-symposia are planned. Each participant is encouraged to bring reprints of pertinent articles and other information concerning his or her current research on macrocyclic molecules. Poster board and space will be available for displaying this material.

The objective of this symposium series is to provide a forum for the presentation and discussion of research activities in the macrocyclic compound field. Both theoretical and experimental aspects of the properties and behaviour of synthetic and naturally occurring macrocyclic compounds will be covered. Some of the topics to be included are: supramolecular chemistry; calixarene chemistry; gas phase reactions; clinical applications; analytical applications; binding with organic cations, anions, and neutral molecules; biological aspects; chemical sensors; industrial applications; kinetics and thermodynamics; molecular recognition; polymolecular compounds; structures of free and complex molecules; designed synthesis; biomimetic chemistry; and selective chemical separations.

The registration fee is USD 360. The fee for graduate and undergraduate students is USD 150. Full refunds are available until 15 July 1992, after this data only a 50% refund is available. The fee includes conference attendance, book of abstracts, selected meals, refreshment breaks, and Tuesday evening dinner and outdoor theater at Sundance Resort. The post-conference tour to Bryce Canyon, Zion Canyon, and Grand Canyon National Parks is not included.

Utah is the second driest state in the United States. Early August is usually hot (30–38°C) and dry. Five national parks, six national monuments, two national recreation areas and one national historic area are found within the State. Excellent highways lead from Salt Lake City to all parts of the State. Numerous high mountain ranges, some exceeding 4000 m, are found with inviting forested wilderness areas which are ideal for camping, hiking, and fishing. Numerous lakes and reservoirs provide opportunity for water sports.

Aerial view of Brigham Young University Campus (1370 m) with Mount Timpanogos (3657 m) in the background.

Structure–activity relationships: QSAR and molecular modelling
Strasbourg, France
7-11 September 1992

IUPAC SPONSORED

The 9th Euroepan Symposium on Structure–Activity Relationships: QSAR and Molecular Modelling' will be held in the Ecole Supèrieure des Hautes Etudes des Industries Chimiques de Strasbourg (EHICS), Université Louis-Pasteur, Strasbourg, France, on 7–11 September 1992. This IUPAC-sponsored symposium is being held under the auspices of the European Federation of Medicinal Chemistry (EFMC) and Societe Francaise de Chimie Thérapeutique (SFCT).

The symposium will deal with recent advances in various areas of structure–activity relationships and their use in the design of new drugs; applications in fields vicinal to medicinal chemistry such as pharmacokinetics, toxicology, agro-chemistry and environmental sciences may also be covered.

The scientific programme will consist of an inaugural lecture, about 20 invited lectures, oral presentations as well as poster sessions. Lectures and posters will focus on all aspects of computer-assisted molecular design, principally QSAR methodologies and successful applications, molecular modelling, experiences with 3D-QSAR and topics in biology which underlie structure–activity relationships.

The offical language of the symposium will be English. No simultaneous translation will be provided.

The registration fees after 30 June are: FRF 2400 for scientific participants; FRF 900 for student participants and FRF 500 for accompanying persons. IUPAC affiliates are entitled to a 10% reduction in the fee. The fee includes registration kit, book of abstracts, the welcome cocktail party, an organ and trumpet concert, morning and afternoon coffees and lunches for the duration of the symposium.

Macrocyclic ligands for the design of new materials
Guildford, Surrey, UK
14–16 September 1992

IUPAC SPONSORED

An IUPAC sponsored International Symposium on Macrocyclic Ligands for the Design of New Materials organized by the European Latin American Research Group will take place at the University of Surrey, Guildford, UK, on 14–16 September 1992. The research group and the symposium organizing committee are chaired by Dr Angela F. Danil de Namor who is a member of the IUPAC Commission on Solubility Data.

The conference language will be English. Scientific communications may be presented in English on French. No simultaneous translation will be provided

The scientific programme will consist of five sessions of plenary and invited lectures:

1. *Synthetic aspects*
- Design of anion receptors, applications (B. Dietrich, Strasbourg, France).
- Synthesis and applications of new calixarene ligands (M. Anthony McKervey, Belfast, UK).
- Asymmetric synthesis of chiral macrocyclic ligands (A Koskinen, Oulu, Finland).

2. *Structural analysis*
- Structural aspects of metal complexes with functionalized tetraazamacrocyclic ligands (T. A. Kaden, Basel, Switzerland).
- Removal of metal ions and organic molecules from aqueous media (J. L. Atwood, Alabama, USA).

3. *Thermodynamics and kinetics*
- Thermodynamics of cation-macrocycle interaction (R. M. Izatt, Utah, USA).
- Co-ordination chemistry of alum gallium(III), and indium(III) complexes with crown ethers and cryptands in polar solvents (H. Schneider, Göttingen, Germany).

4. *The use of macrocyclic ligands in transforming the properties of metal surfaces*
- Self assembly ligands for solution and surfaces (J. J. Holmes, Blackley, UK).

5. *Applications in metal extraction, chiral separations and environmental chemistry*
- Metal ion recognitions by macrocyclic ligands (D. E. Fenton, Sheffield, UK).
- Solid polymer electrolytes and macrocyclic ligand–ion interactions (J. W. Lorimer, Ontario, Canada).
- Plenary lectures plus one invited lecture from each session will be published in *PAC*.

In addition to these five sessions there will be about 24 short 15-minute oral contributions, poster sessions and two round-tables with the participation of experts in European and Latin American affairs on:

- The role of chemistry in the industrial development of Latin America.
- Chemistry links between Europe and Latin America: New strategies.

The registration fees are GBP 150 for participants, GBP 35 for students and GBP 40 for accompanying persons. IUPAC affiliates are entitled to a 10% reduction in fees. University accommodation mostly in single rooms but also with double occupancy will be available.

Guildford is 29 miles south-west of London and a 36-59 train ride from the centre of the capital. There are also direct rail services to London Heathrow and Gatwick Airports.

Analytical chemistry
Reading, UK
20–26 September 1992

IUPAC SPONSORED

An International Conference on Analytical Chemistry (SAC 92) organized jointly by the Analytical Division of The Royal Society of Chemistry and the Laboratory of the Government Chemist will held at the University of Reading, UK. This is the tenth in the series of triennial conferences orginally started by the Society for Analytical Chemistry (hence SAC), and which on this occasion also celebrates the 150th anniversary of the founding of the laboratory of the Government Chemistry (LGC).

SAC 92

The conference will be based in the Palmer Building of the University of Reading. Accommodation has been booked in the university's halls of residence which are conveniently situated close-by. Reading is 30 miles west of London, just off the M4 motorway and has a direct bus link with Heathrow Airport, and direct rail access to Gatwick Airport.

The scientific programme will be organized around plenary, invited and contributed papers and posters covering the whole field of analytical chemistry. As at previous conferences, special sessions on particular analytical themes will be organized by interested subject groups. These will include 'Spectroscopy across the spectrum,' the third in the series of international meetings organized by the Molecular Spectroscopy Group. The programme will also include workshops where research workers can demonstrate experimental or prototype apparatus and techniques.

There will be an opportunity for all participants to visit the Laboratory of the Government Chemist and other scientific establishments.

The language of the conference will be English.

The opening address 'The Laboratory of the Government Chemist: Past and Future' will be delivered by The Government Chemist, Dr R. D. Worswick. There will be five plenary lectures:

- The development of an international measurement system (Dr B. King, Laboratory of the Government Chemist, UK);
- Speciation in atmospheric trace analysis: analytical chemistry with inadequacies and compromises (Prof. D. Kockow, Institute für Spektrochemie, Dortmund, Germany);
- Combination of separation methods with mass spectrometry and other spectroscopic techniques – multidimensional analytical chemistry (Prof. D. E. Games, University College of Swansea, UK);
- Recent advances in analytical chemometrics (Prof. B. R. Kowalski, University of Washington, USA);
- Flow-through (bio)chemical sensors (Prof. M. Calcarcel, Universidad de Cordoba, Spain).

The scientific work of the conference will be centred around the presentation and discussion of contributed papers on all aspects of analytical chemistry. Contributed papers will be presented in lecture sessions or poster displays.

The following special sessions will also be included in SAC 92:

- Spectroscopy across the spectrum;
- Chemometrics in action;
- The evolution of elemental analysis over 150 years;
- Laboratory automation in analysis;
- Developments in instrument design for atomic spectroscopy;
- Standards, standardization and data analysis in atomic spectroscopy;
- Laboratory quality assurance, accreditation and validation.

Workshops in SAC 92 are working demonstrations of apparatus and techniques developed by research workers in educational and industrial institutions. However, a separate section of prototype developments by commercial instrument manufacturers will also be held, where such developments may be of general interest to the analytical community.

The social programme includes: mixer reception, reception at Thames Water Utilities Laboratory, LGC reception, conference banquet and barbecue.

Approximate registration fees for RSC members and members of organizing bodies are GBP 195 and for non-members GBP 295. The daily full-board cost (without private facilities) in single study-bedrooms in the halls of residence of the University of Reading will be approximately GBP 37.00.

Polymer spectroscopy
St Petersburg, Russia
29 September–2 October 1992

IUPAC SPONSORED

The 10th European Symposium on Polymer Spectrosopy will be held in St Petersburg, Russia from Tuesday 29th September to Friday 2nd October. ESOPS-10 is being organized by the Russian Academy of Sciences (Institute of Macromolecular Compounds, St Petersburg; A. F. Ioffe Physico-Technical Institute, St Petersburg; and the Institute of Spectroscopy, Moscow).

ESOPS-10 will cover all kinds of molecular spectroscopy in the field of polymer science with special attention to intermolecular interaction in solid and liquid polymer systems. The conference language will be English.

A view of the River Neva and Peter and Paul's Fortress from the windows of the House of Scientists, Institute of Macrcomolecular Compounds, St Petersburg – venue of ESOPS-10. The House of Scientists was the former Grand Duke's Palace.

The programme includes about 15 invited plenary lectures and provision for an unlimited number of posters. The preliminary list of invited speakers include: R. Chujo (Japan); J. Grasselli (USA); W. Gronski (Germany); P. Hendra (UK); D. Hummel (Germany); H. Neugebauer (Austria); J. Pastor (Spain); B. Randy (Sweden); H. Roth (Germany); H. Siesler (Germany); J. Spevacek (Czechoslovakia); G. Zerbi (Italy); I. Noda (USA) and J. Rabolt (USA).

Foreign participants will be accommodated in comfortable hotels in a central part of the city. Inexpensive accommodation will also be available.

The first circular announces that the registration will be about USD 300 for regular participants. The cost of proceedings are included in this fee. The fee for students will be about USD 100. Affiliates are entitled to a 10% reduction in the regular fee. For accompanying persons the fee will not exceed USD 50.

Thermodynamics of solutions and biological systems

IUPAC SPONSORED

New Delhi, India
3–6 January 1993

An International Conference on Thermodynamics of Solutions and Biological Systems will be held in New Delhi in January 1993. The conference, jointly sponsored by IUPAC, the Indian National Science Academy, the Indian Institute of Technology, and Panjab University, Chandigarh, will focus on the latest developments on various aspects of thermodynamics of solutions and biological systems.

India has a large group of scientists with interests in different areas of thermodynamics, but opportunities are available only to a small number of them – in particular of the younger generation – to attend international scientific meetings abroad. A special objective of this conference is therefore to bring together Indian scientists with interests in the themes of the conference, with their colleagues from other parts fo the world.

The conference will concentrate on the following themes:

1. Solutions of electrolytes and non-electrolytes (low-molecular-weight solutes, aggregates including micelles, polymers and their compatibility).
2. Well-defined biochemical systems and living cellular systems.

The scientific programme will consist of plenary and invited lectures, short oral reports and poster presentations on experimental, theoretical and methodological investigations in thermodyamics of solutions and biological systems. Reports on basic as well as applied work are invited. The programme will be structured to allow ample time for discussions in the sessions as well as in smaller groups.

The official language of the conference will be English.

The registration fees before/after September 30th are: scientific participants USD 300/350; IUPAC affiliates and scientific participants from academies of Third World countries USD 270/300; accompany persons and student participants USD 130/160. The registration fee will include registration kit, morning tea/coffee, working lunch and afternoon tea for the duration of the conference.

Prof. D. V. S. Jain (Panjab University, Chandigarh) is a member of the International Scientific Programme Organizing Committee of the New Delhi conference and Co-Chairman of the National Organizing Committee. He is a member of the IUPAC Publications Committee.

Accommodation in hotels with private shower or bath including breakfast is expected to cost per person per night: USD 60–120 in single occupancy rooms; and USD 40–60 in double occupancy rooms (shared by two persons).

New Delhi, the capital of India, is dotted with places of historical interest and has a wealth of cultural institutions. It has several universities, the Indian Institute of Technology, several national laboratories and a host of other scientific institutions and departments.

Pre- and post-conference tours to scientific institutes and tourist sites in and around Delhi and to different parts of India are planned for participants and accompanying persons.

New Delhi's Indira Gandhi International Airport is served by most international airlines. The capital is well connected by air, rail and roads to other Indian cities.

January is a delightful time of the year with a lot of sunshine. The day temperatures range between 14 and 20°C, while the night temperatures remain between 5 and 8°C.

Molecular spectroscopy

The 21st European Congress on Molecular Spectrosocpy (EUCMOS XXI) will be held at the Technical University of Vienna, Austria, on 23–28 August 1992. The conference is organized by the Working Group on Molecular Spectrosocpy of the Austrian Society for Analytical Chemistry and supported by the Working Party on Analytical Chemistry of the Federation of European Chemical Societies.

The congress will highlight modern trends and recent developments in the rapidly expanding field of molecular spectrosocpy. Both methods and applications will be treated in 9 sessions including plenary, keynote and contributed oral and poster presentations.

Further information from: Interconvention Vienna, Mrs Eva M. Schaup, Austria Center, A-1450 Vienna, Austria. Tel: +43 (222) 2369 2647. Fax: +43 (222) 2369 648.

Symposium in Tunisia

An International Symposium on the Transfer of Scientific and Technological Knowledge will be held in Tunis, Tunisia from 31 August to 4 September 1992.

For further information please contact: Madame Zohra Ben Lakhdar, Colloque ANTHENA 92, Faculté des Sciences – Campus Universitaire, TN-1060 Tunis, Tunisia.

Barley for food and malt

An International Symposium on Barley for Food and Malt will be held at the Swedish University of Agricultural Sciences, Uppsala, Sweden, on 7–10 September 1992. The symposium is being jointly organized by the International Association for Cereal Science and Technology (ICC) – an Associated Organization of IUPAC – and the Swedish Cereal Association (SCF). Keynote lectures on the following topics will be presented: barley composition, structure and quality for food; barley processing and products; barley and malt; barley and nutrition. The language of the symposium will be English.

For further information please contact: Dr Karl Inge Alden, The Conference Department, Swedish University of Agricultural Sciences, PO Box 7070, S-750 07 Uppsala, Sweden. Tel: +46 (18) 671 000.

International Conference on Nutrition

The International Conference on Nutrition (ICN) – to be jointly convened by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) in Rome, Italy, in December 1992 – will be the first intergovernmental conference at which food, nutrition and health will be considered globally from a political standpoint. The World Food Conference of 1974 was primarily devoted to hunger, but the ICN will look at nutrition in the broader framework of development.

The conference will be open to all member countries of FAO and WHO, intergovernmental organizations and representatives of Non-Governmental Organizations (NGOs). NGOs interested in participating in ICN preparations are requested to inform the FAO/WHO Joint Secretariat and communicate their ideas regarding possible contributions.

For further information please contact: FAO/WHO Joint Secretariat, ICN, Via delle Terme di Caracalla, 00100 Rome, Italy. Tel: +39 (6) 5797 3097 or 5797 3627. Fax: +39 (6) 57976661. Telex: 610181 FAO I.

Trace elements and free radicals in oxidative diseases

The French Society for the Study and Research on Essential Trace Elements is organizing its 4th International Meeting on Trace Elements in Medicine and Biology at Chamonix, France, on 5–9 April 1993. The language of the meeting will be English with simultaneous translation into French.

The main topics of the scientific programme concern the relations between trace elements and free radicals. The specific topics are: Trace elements: zinc, selenium, iron and copper; Free radicals: peroxidation, DNA, lipids; Diseases: cancer, inflammation, aging, atheroschlerosis (and immunity).

For further information please contact: Prof. Alain Favier/ Madame Arlett Alcaraz, Laboratoire de Biochimie C, Hopital A. Michallon, BP217 X, 38043 Grenoble Cedex 09, France. Tel: +33 (76) 765 407. Fax: +33 (76) 426 644.

Conference Calendar

Conference circulars and registrations forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in italics.

1992

Organic synthesis

28 June–2 July. International Conference on Organic Synthesis. Montréal, Québec, Canada. *Prof. Jean-Claude Richer, Département de Chimie, Université de Montréal, C.P. 6128 Succursale A, Montréal, Quebéc H3C 3J7, Canada. Tel: +1 (514) 3436744. Fax: +1 (514) 3436624.*

Surface chemistry, adsorption and chromatography

29 June–3 July. 2nd International Symposium on Surface Chemistry, Adsorption and Chromatography. Moscow, Russia. *Prof. O. Larionov, Institute of Physical Chemistry, Russian Academy of Sciences, Leninski Prospekt 31, Moscow 117915, Russia.*

Carbohydrates

5–10 July. 16th International Carbohydrates Symposium. Paris, France. *Prof. Jean-Claude Depezay, General Secretary, XVIth International Carbohydrate Symposium, Laboratoire de Chimie URA 400, Univeristé René Descartes, 45 rue des Saints-Pères, F-75270 Paris Cedex 06, France. Tel: + 33 (1) 42862176. Fax: +33 (1) 4286 0402.*

Ring opening polymerization

7–11 July. International Symposium on Ring Opening Polymerization. Warsaw, Poland. *R.O.P. Organizing Committee, Institute of Polymer Chemistry, Polish Academy of Sciences, ul. M. Curie-Sklodowskiej 34, 41-800 Zabrze, Poland. Tel: +48 (32) 716077. Fax: +48 (32) 712 969. Telex: 36713 POLMER PL.*

Solubility phenomena

8–10 July. 5th International Symposium on Solubility Phenomena. Moscow, Russia.

Dr K. G. Kravchuk, Symposium Secretary of 5th ISSP, N.S. Kurnakov, Institute of General and Inorganic Chemistry, Leninsky av., 31, 117907 GSP-1, Moscow, Russia. Tel: +7 (095) 952 1801/954 3344. Fax: +7 (095) 954 1279.

Computers in chemical research and education

12–17 July. 10th International Conference on Computers in Chemical Research and Education. Jerusalem, Israel.
Professor Y. Wolman, Department of Organic Chemistry, The Hebrew University, Jerusalem 91904, Israel.

Risk management of chemicals

13–16 July. International Symposium on Risk Management of Chemicals – Can Chemicals be Used Safely? Guildford, UK.
Dr J. F. Gibson, Secretary (Scientific), The Royal Society of Chemistry, Burlington House, Piccadilly, London W1V OBN, UK. Tel: +44 (71) 437 8656. Fax: +44 (71) 437 8883. Telex: 268000.

Macromolecules

13–18 July. 34th International Symposium on Macromolecules. Prague, Czechoslovakia.
IUPAC Macro 92 Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského nám. 18882/2, 162 06 Prague 6, Czechoslovakia. Tel: + 42 (2) 360 317. Fax: +42 (2) 367 981. Telex: 122019 IMCP C.

Chemistry, agriculture and the environment

16–18 July. International Conference on Chemistry, Agriculture and the Environment. Guildford, Surrey, UK.
Dr D. Stevenson, Robens Institute of Health & Safety, University of Surrey, Guildford, Surrey GU2 5DX, UK. Tel: +44 (483) 509 220. Fax: +44 (483) 503 517.

Novel aromatic compounds

19–24 July. 7th International Symposium on Novel Aromatic Compounds. Victoria, B.C., Canada.
Dr R. H. Mitchell, Department of Chemistry, University of Victoria, Box 3055, Victoria, B.C., Canada V8W 3P6. Tel: +1 (604) 721 7159. Fax: +1 (604) 721 7147.

Coordination chemistry

19–24 July. 29th International Conference on Coordination Chemistry. Lausanne, Switzerland.
29th ICCC Secretariat, AKM Congress Service, Clarastrasse 57, PO Box, CH-4005 Basel, Switzerland. Tel: +41 (61) 691 5111. Fax: +41 (61) 691 8189.

Photochemistry

19–25 July. 14th International Symposium on Photochemistry. Leuven, Belgium.
Organizing Committee, IUPAC Photochemistry, K.U. Leuven, Department of Chemistry, Celestijnenlaan 200F, B-30001 Heverlee, Belgium. Tel: +32 (16) 200 656. Fax: +32 (16) 201 215.

Exploration, mining and processing of materials

2–7 August. 3rd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials. Randburg, Transvaal, Republic of South Africa.
The Symposium Secretariat, Mintek, Private Bag X3015, Randburg, 2125 South Africa. Tel: +27 (11) 793 3511. Fax: +27 (11) 793 2413. Telex: 424867 SA.

Physical organic chemistry

2–7 August. 11th International Conference on Physical Organic Chemistry. New York, USA.
Prof. H. F. Koch, Department of Chemistry, Ithaca College, Ithaca, NY 14850, USA.

Macrocyclic chemistry

9–14 August. 17th International Symposium on Macrocyclic Chemistry. Provo, Utah, USA.
Dr R. M. Izatt, Chemistry Department,: ISMC, 226 ESC, Brigham Young University, Provo, UT 84602, USA. Tel: +1 (801) 378 4066. Fax: +1 (801) 378 5474. Telex: 706448.

Biotechnology

16–21 August. 9th International Biotechnology Symposium. Crystal City, Virginia, USA.
9th International Biotechnology Symposium Headquarters, American Chemical Society, Meetings, PO Box 18598, 20th St. Station, Washington, DC 20036-8598, USA.

Chemical thermodynamics

16–21 August. 12th International Conference on Chemical Thermodynamics (ICCT). Utah, USA.
ICCT Symposium Headquarters, Chemistry Department, Brigham Young University, Provo, UT 84602, USA. Tel: +1 (801) 378 6269. Fax: +1 (801) 378 5474. Telex: 706448.

Snowbird, Utah: venue of the 12th IUPAC Conference on Chemical Thermodynamics.

Flame structure

18–22 August. 4th International Seminar on Flame Structure. Novosibirsk, Russia.
Prof. V. E. Zarko, Chairman IV-ISFS, Institute of Chemical Kinetics and Combustion, Novosibirsk 630090, Russia. Tel: +7 (383) 235 7030. Fax: +7 (383) 235 2350. Telex: 133148 KING SU.

Natural products

30 August–4 September. 18th International Symposium on Natural Products. Strasbourg, France.
Ms. M.-Cl. Dillenseger & A. Cheminat, Centre de Neurochimie, 5 rue Blaise Pascal, 67084 Strasbourg, France. Tel: +33 (88) 376 767. Fax: +33 (88) 395 318. Telex: Palcost 890666F, mentioning "Congrès Louis Pasteur, IUPAC Symposium".

Raman spectroscopy

31 August–4 September. 13th International Conference on Raman Spectroscopy. Würzburg, Germany.
Prof. W. Kiefer, Institut für Physikalische Chemie, Universität Würzburg, Marcusstrasse 9-11, W-8700 Würzburg, Germany.

CHEMRAWN VIII

6–9 September. World Conference: Chemistry and Sustainable Development Towards a Clean Environment, Zero Waste and Highest Energy Efficiency. Moscow, Russia.
Prof. V. A. Koptyug, Presidium of Russian Academy of Sciences, Leninskii Prospekt 14, 117901 Moscow, Russia. Fax: +7 (095) 230 2043/ 230 2630. Telex: 411964 ANS SU.

Nickel metabolism and toxicology

7–11 September. 5th International Conference on Nickel Metabolism and Toxicology. Ontario, Canada.
5th International Conference on Nickel Metabolism and Toxicology, c/o Falconbridge Limited, Ms. Margaret Koski, Falconbridge, Ontario, Canada POM 1SO. Tel: +1 (705) 6731161. Fax: +1(705)6737666.

QSAR and molecular modelling

7–11 September. 9th European Symposium on Structure–Activity Relationships: QSAR and Molecular Modelling. Strasbourg, France.
Alsace Congres/QSAR, 20 rue du Jeu des Enfants, BP 453 R10, F-67010 Strasbourg Cedex. Tel: +33 (88) 838 761. Fax: +33 (88) 221 830.

Visas

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Medicinal chemistry

13–17 September. 12th International Symposium on Medicinal Chemistry. Basel, Switzerland.
XIIth International Symposium on Medicinal Chemistry, PO Box, CH-4002 Basel, Switzerland. Tel: +41 (61) 696 6306. Fax: +41 (61) 696 7082.Telex: 963126.

Macrocyclic ligands

14–16 September. International Symposium on Macrocyclic Ligands for the Design of New Materials. Guildford, Surrey, UK.
Dr Angela F. Danil de Namor, Chairman, International Symposium on Macrocyclic Ligands for the Design of New Materials, Chemistry Department, University of Surrey, Guildford GU2 5XH, Surrey, UK. Tel: +44 (483) 300 800, ext. 2588. Fax: +44 (483) 300 803. Telex: 859331 G.

Organic substances in soil and water

14–17 September. International Conference on Organic Substances in Soil and Water. Lancaster, UK.
Miss C. Martin, Centre for Research on Environmental Systems, Institute of Environmental and Biological Sciences, University of Lancaster, Bailrigg, Lancaster, LA1 4YQ, UK. Tel: +44 (524) 65201. Fax: +44 (524) 843854.

Analytical chemistry

20–26 September. SAC 92: International Conference on Analytical Chemistry. Reading, UK.
The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V OBN, UK. Tel: +44 (71) 437 8656.

Excited state electron transfer and related phenomena

27 September–2 October. International Symposium on Experimental and Theoretical Aspects of Excited State Electron Transfer and Related Phenomena. Pultusk, Nr Warsaw, Poland.
Dr J. Waluk, Photochemistry & Spectroscopy Laboratory, Institute of Physical Chemistry, Polish Academy of Sciences, Kasprzaka 44/52, 01-224 Warsaw, Poland. Tel: +48 (22) 327 269. Fax: +48 (22) 325 276. Telex: 817097 ICHFPL.

Polymer spectroscopy

29 September–2 October. 10th European Symposium on Polymer Spectroscopy. St Petersburg, Russia.
ESCOPS – 10th Organizing Committee, Dr Purkina A.V., Mrs. Kovalenko I.V, Institute of Macromolecular Compounds, Russian Academy of Sciences, Bolshoi Prospect 31, St Petersburg 199004, Russia. Tel: +7 (812) 218 4001/213 1070. Fax: +7 (812) 218 6869.

Mycotoxins and phycotoxins

8–12 November. 8th International Symposium on Mycotoxins and Phycotoxins. Mexico City, Mexico.
Dra. Magda Carvajal, Secretariado del Simposio, VIII Simposio Internacional IUPAC sobre Micotoxinas y Ficotoxinas, Insurgentes Sur 3700-C, Apartado Postal 101-63, 04530 México, D.F. Tel: +52 (5) 550 5883. Fax: +52 (5) 548 8207. Telex: 177 4523 UNAMME.

Chemical education

17–21 December. 12th International Conference on Chemical Education. Bangkok, Thailand.
Dr Pirawan Bhanthumnavin, Department of Chemistry, Chulalongkorn University, Phya Thai Road, Bangkok 10330, Thailand.

1993

Thermodynamics of solutions and biological systems

3–6 January. International Conference on Thermodynamics of Solutions and Biological Systems. New Delhi, India.
Prof. J. C. Ahluwalia, Department of Chemistry, Indian Institute of Technology, Hauz Khas, New Delhi - 110016, India. Tel: +91 (11) 653 474/ 653 576 (office), +91 (11) 664 519 (home). Fax: +91 (11) 686 2037. Telex: 3173087 or 3161460 - IITD-IN.

Bioorganic chemistry

7–10 June. 2nd International Symposium on Bioorganic Chemistry. Fukuoaka, Japan.
Symposium Secretariat, 2nd International Symposium on Bioorganic Chemistry, Department of Chemical Science and Technology, Faculty of Engineering, Kyushu University 36, Higashi-ku, Fukuoka 812, Japan. Fax: +81 (92) 632 1842.

Carotenoids

20–25 June. 10th International Symposium on Carotenoids. Trondheim, Norway.
Prof. S. Liaaen-Jensen, Laboratory of Organic Chemistry, The Norwegian Institute of Technology, University of Trondheim-NTH, N-7034 Trondheim-NTH, Norway.

Boron chemistry

11–15 July. 8th International Meeting on Boron Chemistry (IMBERON VIII), Tennessee, USA.
Prof. G. W. Kabalka, Director of Basic Research, The University of Tennessee, Biomedical Imaging Center, 575 Buehler Hall, Knoxville, TN 37996-1600, USA.

Optics and dynamics of polymers

12–15 July. 33rd Microsymposium on Macromolecules, Optics and Dynamics of Polymers. Prague, Czechoslovakia.
33rd Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 6, Czechoslovakia. Tel: +42 (2) 360 317. Fax: +42 (2) 367 981. Telex: 122019 IMCP C.

Fluorinated monomers and polymers

19–22 July. 34th Microsymposium on Macromolecules, Fluorinated Monomers and Polymers. Prague, Czechoslovakia.
34th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162-06 Prague 6, Czechoslovakia. Tel: +42 (2) 360 317. Fax: +42 (2) 367 981. Telex: 122019 IMCP C.

IUPAC General Assembly

5–12 August. 37th IUPAC General Assembly. Lisbon, Portugal.
The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.

IUPAC Congress

15–20 August.
34th IUPAC Congress.
Beijing, China.

Prof. Xinqi Song,
Secretary General of 34th IUPAC Congress,
c/o Chinese Chemical Society,
PO Box 2709,
Beijing 100080,
China.

Tel: +86 (1) 256 8157 or 256 4020.
Telex: 20035 CAST CN c/o CAST.

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably 2 YEARS and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *CI*, Vol. 11, No. 1, pp. 4–5, 1989.

Solution chemistry

15–21 August. 23rd International Conference on Solution Chemistry. Leicester, UK.
Dr M. J. Blandamer, Department of Chemistry, Leicester University, University Road, Leicester, LE1 7RH, UK.

1994

Natural products chemistry

16–20 January. 19th International Symposium on the Chemistry of Natural Products. Karachi, Pakistan.
Prof. Atta-ur-Rahman, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan.

Coordination Chemistry

24–29 July. 30th International Conference on Coordination Chemistry. Kyoto, Japan.
Prof. H. Ohtaki, Laboratories of Coordination Chemistry, Institute for Molecular Science, Myodaiji-cho, Okazaki 444, Japan.

Physical organic chemistry

September. 12th International Conference on Physical Organic Chemistry. Padova, Italy.
Prof. G. Scorrano, Dipartimento di Chimica Organica, Università degli Studi di Padova, Via Marzolo 1, 35100 Padova, Italy. Fax: +39 (49) 831 222.

PURE AND APPLIED CHEMISTRY

Official Journal of the International Union of Pure and Applied Chemistry

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- to publish the recommendations of the Union's commissions on nomenclature, symbols and units;
- to publish technical reports on standardization, recommended procedures, collaborative studies, data compilations, etc.;
- to publish critically evaluated state-of-the-art commissioned review articles on important topics.

Subscription Information

Pure and Applied Chemistry is published monthly. Subscription rates for 1992 are £490.00 (UK), £530.00 (overseas) and US$795.00 (USA & Canada) post free.

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KIYOSHI OKUDA

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.
Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 44 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International

IUPAC

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The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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1992, Vol. 14. No. 5 (September)

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EDITOR: Michael Freemantle.
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Front cover: Chemistry class at Queen's College, Yaba, Lagos, Nigeria. *(PHOTO courtesy UNESCO/Almasy-Vauthey).*

IUPAC 1991

Maurice Williams

Each year, IUPAC Executive Secretary Dr Maurice Williams prepares a report on IUPAC activities for the International Council of Scientific Unions (ICSU). The following is his 1991 report.

Introduction

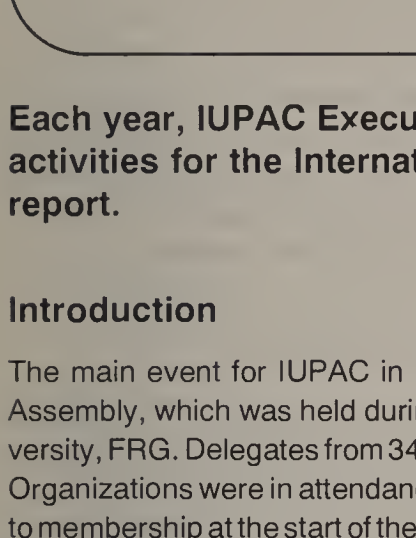
The main event for IUPAC in 1991 was its 36th General Assembly, which was held during August at Hamburg University, FRG. Delegates from 34 of the 45 National Adhering Organizations were in attendance. Belgium was readmitted to membership at the start of the Council meeting. Accounts of the deliberations are given in *CI* (Nos. 1–3, 1992).

The IUPAC Officers for the period 1991–93 are:

- President – Prof. A. J. Bard (USA)
- Vice-President – Prof. H. A. Staab (FRG)
- Secretary General – Prof. G. den Boef (the Netherlands)
- Treasurer – Prof. J. M. Ward (UK)

Because of arrears in its annual subscription, Iraq ceased to be a member of the Union. The Chemical Society of the South Pacific, EURACHEM, and the Calorimetry Conference were admitted to Associated Organization status. The Chemical Sciences Section, Romanian Academy, was accepted as an Observer Country.

In connection with restructuring of the Union, an impasse was reached on the proposed, but controversial amalgamation of several commissions. However, it was decided to discontinue all non-nomenclature/symbols projects more than ten years old: those relating to nomenclature/symbols will be discontinued no later than the 1993 General Assembly.



The 36th IUPAC General Assembly was held in Hamburg.

Scientists from 48 countries gathered in Baltimore for the CHEMRAWN VII World Conference on Chemistry of the Atmosphere: Its Impact on Global Change.

Mission-orientated programmes

Having fulfilled its objective of stimulating increased IUPAC activity in the area, the Coordinating Committee for the mission-orientated programme on Chemistry and the Environment was dissolved. Professor V. A. Koptyug will continue to play a coordinating role during the next biennium. Also, he represented IUPAC in preparations for the United Nations Conference on Environment and Development at Rio de Janeiro in June 1992.

A modest start was made on the second mission-orientated programme, Chemistry and Advanced Materials. Regrettably, the present financial difficulties of the Union are such, that no additional programmes of this type (e.g. chemistry and biosciences, biotechnology, computers and chemistry) will be considered until 1993.

CHEMRAWN

CHEMRAWN VII – World Conference on Chemistry of the Atmosphere: Its Impact on Global Change – gathered together scientists from 48 countries during December at Baltimore. In order to permit their attendance, a training workshop for young chemists, many of them from developing countries, was arranged in conjunction with the Conference.

The recommendations for future action address the problems of stratospheric ozone depletion, global warming, air pollution and acid rain, as well as more general aspects of global-change chemistry. They have been passed to the committees preparing for UNCED 1992. The dual focus on science and policy remains the main theme of the Chemical Research Applied to World Needs programme.

Teaching chemistry

A main concern of the Committee on Teaching of Chemistry has been the ever-widening gap between the teaching and practice of chemistry in advanced and in less-developed countries. Over the past 10 years CTC has therefore introduced an instrumentation culture in student laboratories through the design, fabrication, and use of locally produced equipment. This "know-how" has been transferred through 42 "hands-on" IUPAC–UNESCO workshops all over the world, culminating in publication of a book *Locally Produced Low-cost Equipment for Teaching of Chemistry*.

Transfermium elements

The Phase (ii) report of the IUPAC–IUPAP Transfermium Working Group – Discovery of the Transfermium Elements – was approved by the two Unions [to be published in *Pure Appl. Chem.* **63** (6), (1992)]. It applies the criteria of Phase (i), on an element-by-element basis, considering and analysing all the pertinent literature. This delineation of discovery profiles has resulted, in some cases, in a sharing of the credit for discovery.

Publications

Significant amongst several important IUPAC publications was the first edition of the *Compendium of Macromolecular Nomenclature* (the Purple Book). At Hamburg it was agreed to prepare a *Compendium of Terminology and Nomenclature in Clinical Chemistry* (the Silver Book). When it is completed, the Union will have a complete range of compendia, covering recommendations for physical, inorganic, organic, macromolecular, analytical and clinical chemistry.

The 33rd IUPAC Congress took place in Budapest.

The Publications Committee is at an advanced stage in developing a database of all reports published in the *Pure Appl. Chem.* since its inception in 1960. It will permit chemists world-wide to find out, via a personal computer, what IUPAC has said on a given topic.

Also, this Committee took the first steps towards producing a student-orientated nomenclature book. The latter is not simply a matter of repackaging the existing IUPAC nomenclature/symbols compendia. It will introduce undergraduate students in particular to the language of chemistry and to the fundamental nomenclature and symbols needed.

Chemical and nuclear weapons

Rather than IUPAC entering into debate on abolition of chemical weapons, it urged ICSU to coordinate and launch a programme to provide the scientifically aware public with information on as many aspects of the consequences of the use – production, transportation, storage, and deployment, and the attendant risks – of biological, chemical, and nuclear weapons.

Irrespective of whether or not ICSU accepts that such a programme should be undertaken, IUPAC decided it would independently enter into a programme of its own on acceptably safe methods of disposal of chemical weapons, namely their destruction, with funds pledged from outside resources. In addition, the Union proposed that ICSU should consider establishing an interdisciplinary project on world energy supplies.

Budapest Congress

The 33rd IUPAC Congress took place during August at Budapest. It provided about 1000 participants from 40 countries with a wide-ranging survey of the present state of knowledge and future trends in various branches of chemistry: analytical chemistry, inorganic and physical chemistry, electrochemistry and electroanalysis, chemistry and biochemistry of biologically active organic compounds, biotechnology, chemistry of fats, and polymer chemistry.

Affiliate Membership Programme

The membership of the IUPAC Affiliate Programme for 1991 (6977 from 87 countries) was down on that for 1991 (7464). However, it was noteworthy that AMP now had over 900, mostly young chemists from developing countries, which formerly had few if any links with IUPAC

Appendix

The following nomenclature reports (IUPAC Recommendations 1991) were published during the year:

1. Proposals for description and measurement of carry-over effects in clinical chemistry, *Pure Appl. Chem.* **63**(2), 301–306 (1991) – Commissions on Automation and Clinical Techniques & Analytical Nomenclature.
2. Terminology in semiconductor electrochemistry and photoelectrochemical energy conversion, *Pure Appl. Chem.* **63**(4), 569–596 (1991) – Commission on Electrochemistry.

3. Nomenclature, symbols, units and their usage in spectrochemical analysis – VIII. Nomenclature system for X-ray spectroscopy, *Pure Appl. Chem.* **63**(5), 735–746 (1991) – Commission on Spectrochemical and Other Optical Procedures for Analysis.
4. English-derived abbreviations for experimental techniques in surface science and chemical spectroscopy, *Pure Appl. Chem.* **63**(6), 887–893 (1991) – Commission on Molecular Structure and Spectroscopy.
5. Nomenclature, symbols, definitions and measurements for electrified interfaces in aqueous dispersions of solids, *Pure Appl. Chem.* **63**(6), 895–906 (1991) – Commission on Colloid and Surface Chemistry including Catalysis.
6. Manual on catalyst characterization, *Pure Appl. Chem.* **63**(9), 1227–1246 (1991) – Commission on Colloid and Surface Chemistry including Catalysis.
7. Nomenclature of derived quantities, *Pure Appl. Chem.* **63**(9), 1307–1311 (1991) – Commission on Quantities and Units in Clinical Chemistry.
8. Recommendations for nomenclature and symbolism for mass spectroscopy (including an appendix of terms used in vacuum technology), *Pure Appl. Chem.* **63**(10), 1541–1566 (1991) – Commission on Molecular Structure and Spectroscopy.
9. JCAMP-DX, a standard format for exchange of infrared spectra in computer readable form, *Pure Appl. Chem.* **63**(12), 1781–1792 (1991) – Commission on Molecular Structure and Spectroscopy.
10. *Compendium of Macromolecular Nomenclature* ('Purple Book' published by Blackwell Scientific Publications, Oxford, 1991).

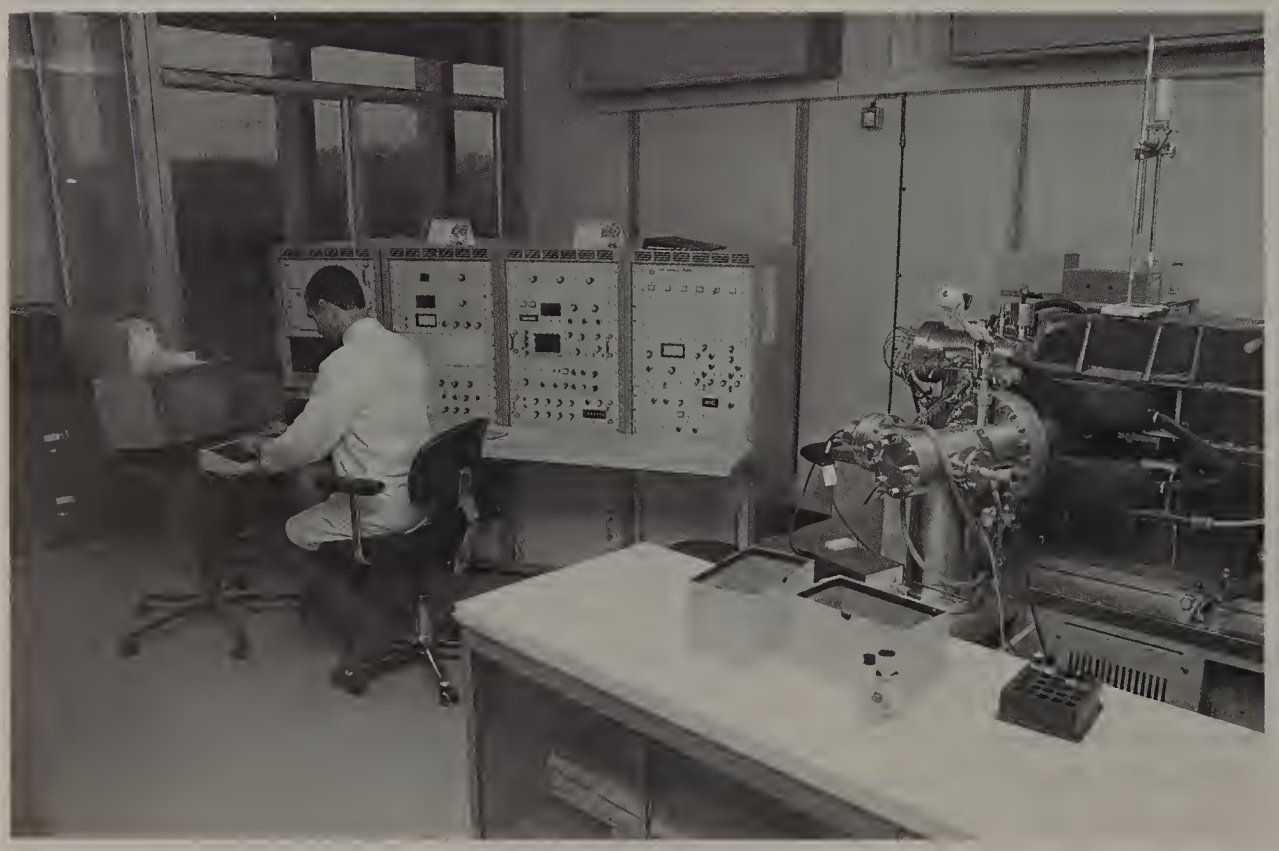
The following technical reports by IUPAC bodies were published during the year:

1. Molar absorption coefficients of transient species in solution, *Pure Appl. Chem.* **63**(2), 289–299 (1991) – Commission on Photochemistry.
2. Radiolabeling of monoclonal antibodies with metal chelates, *Pure Appl. Chem.* **63**(3), 427–463 (1991) – Commission on Radiochemistry and Nuclear Techniques.
3. Critical survey of stability constants of complexes of glycine, *Pure Appl. Chem.* **63**(4), 597–638 (1991) – Commission on Equilibrium Data.
4. Metal buffers in chemical analysis – Part II: Practical considerations, *Pure Appl. Chem.* **63**(4), 639–642 (1991) – Commission on General Aspects of Analytical Chemistry.
5. Real surface area measurements in electrochemistry, *Pure Appl. Chem.* **63**(5), 711–734 (1991) – Commission on Electrochemistry.
6. IUPAC reports on pesticides (28): Some aspects of the analysis of residues of dicarboximide fungicides in food, *Pure Appl. Chem.* **63**(5), 747–762 (1991) – Commission on Agrochemicals.
7. Assessment of uncertainties in projected concentrations of carbon dioxide in the atmosphere (International Workshop, ECN, Petten, the Netherlands: 4–6 July 1990), *Pure Appl. Chem.* **63**(5), 763–796 (1991) – Commission on Atmospheric Chemistry.

IUPAC report No. 28 on pesticides was published in 1991.

8. Criteria that must be satisfied for the discovery of a new chemical element to be recognized, *Pure Appl. Chem.* **63**(6), 879–886 (1991) – IUPAC–IUPAP Transfermium Working Group.
9. Analysis of wet deposition (acid rain): determination of the major anionic constituents by ion chromatography, *Pure Appl. Chem.* **63**(6), 907–915 (1991) – Commissions on Environmental Analytical Chemistry and Electroanalytical Chemistry.
10. Atomic weights of the elements 1989, *Pure Appl. Chem.* **63**(7), 975–990 (1991) – Commission on Atomic Weights and Isotopic Abundances.
11. Isotopic compositions of the elements 1989, *Pure Appl. Chem.* **63**(7), 991–1002 (1991) – Commission on Atomic Weights and Isotopic Abundances.
12. Methods for production of radical ions in low temperature matrices for electronic spectroscopy, *Pure Appl. Chem.* **63**(7), 1003–1014 (1991) – Commission on Photochemistry.
13. Critical evaluation of stability constants for nucleotide complexes with protons and metal ions and the accompanying enthalpy changes, *Pure Appl. Chem.* **63**(7), 1015–1080 (1991) – Commission on Equilibrium Data.
14. Determination of mono- and diglycerides by capillary gas chromatograpy: results of a collaborative study and standardized method, *Pure Appl. Chem.* **63**(8), 1153–1162 (1991) – Commission on Oils, Fats, and Derivatives.
15. Determination of polymerized triglycerides in oils and fats by high performance liquid chromatography: results of a collaborative study and standardized method, *Pure Appl. Chem.* **63**(8), 1163–1171 (1991) – Commission on Oils, Fats and Derivatives.
16. Determination of triglycerides in vegetable oils in terms of their partition numbers by high performance liquid chromatography: results of a collaborative study and standardized method, *Pure Appl. Chem.* **63**(8) 1173–1182 (1991) – Commission on Oils, Fats and Derivatives.
17. Determination of lead in oils and fats by direct graphite furnace atomic absorption spectrometry: results of a collaborative study and standardized method, *Pure Appl. Chem.* **63** (8), 1183–1190 (1991) – Commission on Oils, Fats and Derivatives.

18. Determination of phosphorus in oils and fats by direct graphite furnace atomic absorption spectrometry: results of a collaborative study and standardized method, *Pure Appl. Chem.* **63**(8), 1191–1198 (1991) – Commission on Oils, Fats and Derivatives.
19. Chemical sensors: definitions and classification, *Pure Appl. Chem.* **63**(9), 1247–1250 (1991) – Commission on General Aspects of Analytical Chemistry.
20. Conductometric analysis of polyelectrolytes in solution, *Pure Appl. Chem.* **63**(9), 1251–1268 (1991) – Commissions on Electroanalytical Chemistry and Equilibrium Data.
21. Isotopic and nuclear analytical techniques in biological systems: A critical survey, *Pure Appl. Chem.* **63**(9), 1269–1306 (1991) – Commission on Radiochemistry and Nuclear Techniques.
22. Practical importance of enzyme stability – I: Natural sources of more stable enzymes; II: Increase of enzyme stability by immobilization and treatment with low molecular weight reagents; III: Increase of enzyme stability by protein engineering, *Pure Appl. Chem.* **63**(10), 1527–1540 (1991) – Steering Committee on Biophysical Chemistry.
23. Intrinsic characterization of continuous fibre reinforced thermoplastic composites – I: Toughness charcterization of carbon fibre, polyether ether ketone (CF/PEEK) laminates, *Pure Appl. Chem.* **63**(11), 1609–1625 (1991) – Commission on Polymer Characterization and Properties
24. Determination of molybdenum in biological materials, *Pure Appl. Chem.* **63**(11), 1627–1636 (1991) – Commission on Microchemical Techniques and Trace Analysis.
25. Analytical techniques for trace organic compounds – III: Mass spectrometry in trace organic analysis, *Pure Appl. Chem.* **63**(11), 1637–1646 (1991) – Commission on Microchemical Techniques and Trace Analysis.
26. Extrapolation of EMF data to infinite dilution in non-aqueous and mixed solvents, *Pure Appl. Chem.* **63**(11), 1647–1658 (1991) – Commission on Electroanalytical Chemistry.
27. Determination of benzo[*a*]pyrene in oils and fats by reversed phase high performance liquid chromatography. Results of a collaborative study and standardized method, *Pure Appl. Chem.* **63**(11), 1659–1666 (1991) – Commission on Oils, Fats and Derivatives.
28. Use of quantitative structure–activity relationships for predicting rates of environmental hydrolysis processes, *Pure Appl. Chem.* **63**(11), 1667–1676 (1991) – Commission on Water Chemistry.
29. Kinetic parameters of the electrode reaction $2Cl^- \rightleftarrows Cl_2 + 2e^-$, *Pure Appl. Chem.* **63**(12), 1759–1779 (1991) – Commission on Electrochemistry.
30. Structure and mechanical properties of ultra-high molecular weight polyethylene deformed near melting temperature, *Pure Appl. Chem.* **63**(12), 1793–1804 (1991) – Commission on Polymer Characterization and Properties.
31. Present and future status of organic analytical reagents – Part III. Organic analytical reagents in electroanalysis, *Pure Appl. Chem.* **63**(12), 1805–1826 (1991) – Commission on General Aspects of Analytical Chemistry.
32. *Measurement of the Transport Properties of Fluids* (*Experimental Thermodynamics* III) (book published by Blackwell Scientific Publications, Oxford, 1991) – Commission on Thermodynamics.
33. *Solubility Data Series*, Vols 45–46. *Gases in Molten Salts* (book published by Pergamon Press, Oxford, 1991) – Commission on Solubility Data.
34. *Solubility Data Series* 47. *Alkali Metal and Ammonium Chlorides in Water and Heavy Water (Binary Systems)* (book published by Pergamon Press, Oxford, 1991) – Commission on Solubility Data.
35. *Locally Produced Low-cost Equipment for Teaching of Chemistry* (Book published by Publication Division, University of Delhi, 1991) – Committee on Teaching of Chemistry.



A technical report on mass spectrometry in trace organic analysis was published in *PAC*.

Twenty-six symposia were sponsored by IUPAC in 1991, namely:

1. Polymer 91 – International Symposium on Preparation, Characterization and Properties of Polymer Materials, Melbourne, Australia, February (Proceedings published as Vol. 53 in the *Macromolecular Symposia* series to the journal *Die Makromolekulare Chemie* by Hüthig and Wepf Verlag, Basel).
2. 2nd International Symposium on Organic Chemistry: 'Technological Perspectives', Baden-Baden, FRG, April (No publication anticipated).
3. 3rd International Symposium on Pharmaceutical and Biomedical Analysis, Boston, Mass., USA, April–May (Proceedings to be published in the journal *Pharmaceutical and Biomedical Analysis*).
4. 6th International Workshop on Vapour–Liquid Equilibria in 1-Alkanol + *n*-Alkane Mixtures, Liblice, Czechoslovakia, May (Report, combined with previous and forthcoming workshops, to be published eventually in *Pure Appl. Chem.*).
5. XXVII Colloquium Spectroscopicum Internationale, Bergen, Norway, June (Proceedings to be published in the journal *The Analyst*).
6. 8th Bratislava Conference on Modified Polymers, Tatranská Lomnica, Czechoslovakia, June (Proceedings to be published as a volume in the *Macromolecular Symposia* series to the journal *Die Makromolekulare Chemie* by Huthig and Wepf Verlag, Basel).
7. International Symposium on Calorimetry and Chemical Thermodynamics, Moscow, Russia, June, *Pure Appl. Chem.* **64**(1) (1992).
8. 7th International Conference on Colloid and Interface Science, Compiegne, France, July (to be published in *Pure Appl. Chem.*).
9. 22nd International Conference on Solution Chemistry, Linz-Auhof, Austria, July, *Pure Appl. Chem.* **63**(12) (1991).
10. 14th Discussion Conference on Macromolecules: 'Rheology of Polymer Melts', Prague, Czechoslovakia, July (Proceedings to be published as a volume in the *Macromolecular Symposia* series to the journal *Die Makromolekulare Chemie*).
11. 10th International Symposium on Plasma Chemistry, Bochum, Germany, August, *Pure Appl. Chem.* **64** (5), (1992).
12. 33rd IUPAC Congress, Budapest, Hungary, August, *Pure Appl. Chem.* **64**(2), (1992).
13. 6th Symposium on Organometallic Chemistry Directed Towards Organic Synthesis, Utrecht, the Netherlands, August, *Pure Appl. Chem.* **64**(3), (1992).
14. 11th Conference on Chemical Education, York, UK, August (selected material to be published in the *International Newsletter on Chemical Education*).
15. International Congress on Analytical Sciences, Chiba, Japan, August, *Pure Appl. Chem.* **64** (4), (1992).
16. 10th International Symposium on Cationic Polymerization and Related Ionic Processes, Balatronfüred, Hungary, August (Proceedings to be published as a volume in the *Macromolecular Symposia* series to the journal *Die Makromolekulare Chemie*).

Don Carlos Hotel, Marbella, Spain, was the venue of the International Symposium on Recycling of Polymers Science and Technology.

17. 4th European Conference on the Spectroscopy of Biological Molecules, York, UK, September (Proceedings published by Royal Society of Chemistry, Cambridge, 1991).
18. 16th International Symposium on Macrocyclic Chemistry, Sheffield, UK, September (Proceedings not to be published).
19. International Conference on the Applications of the Mössbauer Effect, Nanjing, China, September (Proceedings to be published in the journal *Hyperfine Interactions*).
20. International Symposium on Recycling of Polymers Science and Technology, Marbella, Spain, September (Proceedings to be published in the *Macromolecular Symposia* series to the journal *Die Makromolekulare Chemie*).
21. International Workshop on Electron-spin-echo Spectroscopy, Novosibirsk, Russia, September (to be published in *Pure Appl. Chem.*).
22. First International Symposium on Self-Propogating High-Temperature Synthesis (SHS), Alma Ata, Russia, September (to be published in *Pure Appl. Chem.*).
23. 4th Macromolecular Metal-Complex Symposium, Sienna, Italy, September–October (Proceedings to be published as a volume in the *Macromolecular Symposia* series to the journal *Die Makromolekulare Chemie*).
24. International Symposium on Olefin and Vinyl Polymerization and Funtionalization: Reaction, Mechanism and Industrial Application, Hanzhou, China, October (Proceedings to be published as a volume in the *Macromolecular Symposia* series to the journal *Die Makromolekulare Chemie*).
25. CHEMRAWN VII – World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change, Baltimore, Maryland, December (Proceedings to be published as a 'Chemistry for the 21st Century Monograph' by Blackwell Scientific Publications, Oxford).
26. International Symposium on New Polymers, Kyoto, Japan, November–December (Proceedings to be published as a volume in the *Macromolecular Symposia* series to the journal *Die Makromolekulare Chemie*).

Stuart L. Schreiber.

Thieme–IUPAC Prize in Synthetic Organic Chemistry

The Thieme–IUPAC Prize of DEM 10 000 is awarded every 2 years on the occasion of the IUPAC-sponsored International Conference of Organic Synthesis (ICOS) to a scientist under 40 years of age, whose research has had a a major impact on the field of synthetic chemistry. The first Thieme–IUPAC Prize was presented at an Award Talk on 29 June 1992 during ICOS 92 in Montreal to Stuart L. Schreiber.

Schreiber, who is a Full Professor at Harvard University, has developed entirely new synthetic methods and strategies for building up ring systems for the stereospecific generation of complex stereochemical arrays and for controlling absolute stereochemistry. He has also synthesized a range of complex natural products and recently reported the total synthesis of immunosuppressive agent FK 506.

Schreiber is an expert not only in synthesis and complex stereochemistry but also in organometallic chemistry, photochemistry and bioorganic chemistry. In the last area he has published research on insect pheromone, T-cell and viral receptors. His many honours and awards include the Ciba-Geigy Drew Award for Biomedical Research (1992): Molecular Basis for Immune Regulation; Arun Guthikonda Memorial Award (1990) and the Award in Pure Chemistry, American Chemical Society (1989).

Atomic weight archives

Norman Greenwood* reports on the IUPAC central archives on atomic weights and their recent transfer to the Beckman Center.

Atomic weights are essential for both the theory and the practice of chemistry in all its aspects. It is not surprising, therefore, that *ad-hoc* committees to establish agreement on the best available values of the atomic weights of the elements were among the very first international committees to be formed by chemists, and they actually predated the formation of IUPAC by at least two decades. An International Commission on Atomic Weights (under varying names) has been a central feature of IUPAC since its inception in 1919, and many distinguished chemists have contributed to its work.

The archival records of the present Commission on Atomic Weights and Isotopic Abundances (II.I) and its predecessor commissions in IUPAC now contain several thousand papers and documents, including numerous original hand-written letters from such prominent early workers in the field as F.W. Aston, Gregory P. Baxter, F. Joliot, R.J. Meyer, Marguerite Perey, Frederick Soddy, M.G. Urbain and R. Whytlaw-Gray. There are also personally signed letters from Neils Bohr, Marie Curie, H. le Chatelier, Otto Hahn, Otto Honigschmidt, R.S. Mulliken, A.O.C. Nier, T.W. Richards, G.T. Seaborg and many others.

Recently several present and past members of the Commission on Atomic Weights and Isotopic Abundances and its various sub-committees agreed to donate their personal files in this area to the newly formed Arnold and Mabel Beckman Center for the History of Chemistry located on the Campus of the University of Pennsylvania in the USA. As such, these documents are now available for study by interested scholars throughout the world. It was also decided to transfer the IUPAC central archives on atomic weights to the Beckman Center, and in March 1992 Norman Greenwood and Steffen Peiser sorted through the voluminous IUPAC records to remove some of the duplicate holdings. The remaining documents were then transferred in eight large box files to the Beckman Center, which, accordingly, now houses a unique and comprehensive collection of original documents on this vital area of chemistry, covering a period of the past 100 years and in some cases even further back.

The types of records include correspondence, membership lists and bibliographical data, agenda, minutes and reports of meetings, photographs, and published or unpublished papers of significance. Professional archivists will work through this mass of material which is being sorted into the following sixteen categories:

1. Atomic weight reports (1820 to the present).
2. Agenda and other preparatory material for meetings.
3. Minutes, news releases and report preparation.
4. Isotopic abundances tables.
5. Isotopic reference materials and variability of isotopic abundances.
6. Uncertainties.
7. Footnotes and annotations.
8. Atomic weights in non-terrestrial materials (see also category 5).
9. Abbreviated tables (to 4 figures and 5 figures).
10. Half-life data relevant to atomic weights.
11. Mononuclidic elements and nuclidic masses.
12. Biographical sketches and membership history, with photographs of some members.

*Norman Greenwood is Emeritus Professor of Chemistry at the University of Leeds, Leeds LS2 9JT, England. He was Chairman of the IUPAC Atomic Weights Commission from 1969 to 1975 and is at present the UK National Representative on Commission II.I.

ICSU statement on gene patenting

The following statement was prepared by ICSU in collaboration with its Committees on Genetic Experimentation (COGENE) and Data for Science and Technology (CODATA). The statement was approved by the ICSU Executive Board, following discussions on this subject at its April 1992 meeting. The Board requested that this statement be given urgent and broad dissemination.

The statement

The International Council of Scientific Unions (ICSU) is an international non-governmental organization whose mandate includes the promotion of cooperation in the basic sciences, and the safeguarding of the principle of the universality of science and of the free flow of scientific knowledge.

The Council is aware of the tremendous potential benefit of genetic research for humanity and realizes that new ethical and social dimensions arise from this. Accordingly, ICSU strongly believes that efforts to patent genetic information should not jeopardize either progress in the basic sciences or access to the information which is necessary for such progress to continue.

ICSU asserts its view that information about nucleic acid sequences cannot be patented *per se*. Such sequences should be patentable solely within the context of their demonstrated significance and/or application (e.g. regulatory signals, antisense RNAs, probes, etc.) – and not of their **potential** products (e.g. proteins) – and provides that this can be shown to be "novel", "non-obvious" and "useful".

Under such circumstances, patenting of complementary DNA sequences (cDNAs) would distort the patent process, which is designed to protect applications, methods and products, on the basis of proven facts and not mere expectations, and normally serves society by stimulating the investments and developments necessary to provide useful products and services. Any deviation from such patenting principles would run counter to the best interests of sciences and hinder international collaboration in such endeavours. ICSU therefore cautions against decisions which may be irreversible, such as those possibly emerging as a result of the recent patent requests concerning complementary DNA (cDNA) sequences corresponding to portions of unknown messenger RNAs (mRNA).

ICSU urges the relevant authorities, particularly in countries where patent applications in this field have been or are soon to be filed, to consider such applications taking due account of the possible implications and to ensure a strict application of established patenting principles, thereby setting an example for other countries in which similar cases may arise in the future.

ICSU would welcome a formal international agreement on this subject.

13. General papers including: (a) papers not well distributed elsewhere or in obscure journals; (b) papers by members which are especially significant; (c) papers on elements, filed by name of the element.
14. Methodology of atomic weight determination.
15. History, general background (IUPAC).
16. Correspondence files (chron files).

Atomic weight archives contain personally signed letters from Marie Curie. (*Photo courtesy Nobelstiftelsen.*)

Anyone who has material of potential interest to the Archive is asked, in the first instance, to contact the present Secretary of Commission II.1, Dr T.B. Coplen, United States Geological Survey, 431 National Center, 12201 Sunrise Valley Drive, Reston, VA 22092, USA, or the writer of this present article.

Guidelines for authors

New authors wishing to contribute to *Chemistry International* are asked to consult the 'Guidelines for authors' published on pages 8–9 of the January 1991 issue of the magazine. Please contact the editor if you require a copy of these guidelines.

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairmen and secretaries and IUPAC officers were published in *Chem. Intl.* **13**, 223–233 (1991). The IUPAC Secretariat has been notified recently of the following changes:

Dr J. Buffle (Chairman, Limited Lifetime Commission on Environmental Analytical Chemistry). Fax: +41 (22) 329 6102.

Dr S. R. Heller (Chairman, Committee on Chemical Databases). Fax: +1 (301) 504 6231.

Prof. P. Müller (Chairman, Commission on Physical Organic Chemistry). Fax: +41 (22) 328 7396.

Letter to the Editor

Consistency in terminology

Sir,

In the IUPAC document "Isotopic and nuclear analytical techniques in biological systems, a critical survey"[1] there is an article by R. Ekins entitled "Radioimmunoassay, Immunoradiometric Assay and Analogous Binding Assays". In this article the concept of *sensitivity* is used in a different sense with regard to the IUPAC definition of this term[2]. In this article the term sensitivity is misused to denote the limit of detection. Let me copy here the IUPAC definitions of these two terms[2]:

Sensitivity. A method is said to be sensitive if a small change in concentration, c, or quantity, q, causes a large change in the measure, x; that is, when the derivative dx/dc or dx/dq is large. The sensitivity, S_i, for element i is the slope of the analytical calibration curve. S_i may vary with the magnitude of c_i or q_i, S_i is usually constant. S_i may also be a function of the c or q of other analytes present in the sample.

Limit of detection. The limit of detection, expressed as the concentration, c_L, or the quantity, q_L, is derived from the smallest measure, x_L, that can be detected with reasonable certainty for a given analytical procedure. The value of x_L is given by the equation

$$x_L = \bar{x}_{bi} + ks_{bi}$$

where $\bar{x}_{bi}$ is the mean of the blank measures, s_{bi} the standard deviation of the blank measures, and k is a numerical factor chosen according to the confidence level desired. (A value of 3 for k is strongly recommended.)

I think that any book, document, paper, etc., published or recommended by IUPAC must follow the terminology and definitions recommended by itself. If not, there is a contradiction that obstructs the international standardization of the scientific terminology.

Dr X. Fuentes-Arderiu,
Servei de Bioquimica Clinica,
Hospital Princeps d'Espanya,
08907 L'Hospitalet de Llobregat,
Barcelona,
Spain.

References

1. Commission on Radiochemistry and Nuclear Techniques, *Pure Appl. Chem.* **63**, 1269–1306 (1991).
2. *Analytical Chemistry Division, Compendium of Analytical Nomenclature: Definitive Rules 1987* (H. Freiser and G. H. Nancollas, Eds), Blackwell Scientific Publications, Oxford (1987).

Affiliate Affairs

Chemistry in Nigeria

Uchenna Kanu.

Nigeria is one of the developing countries in Africa that is making appreciable efforts to establish a viable, self-reliant, sustainable and lasting economy that will retain no traces of under-development and dependence. The country aims to ensure a new order whereby it will be seen and recognized as being independent and developed socially, politically, economically and technologically.

As a result, much emphasis is being laid by various methods on the need to use local raw materials in our industries, develop local technology and modify foreign technology for our requirements. This demand must be met by all our industries, including the chemical and allied industries, if they are to continue to exist.

Chemistry activities in our industries range from the production of chemicals and chemical by-products to the production of finished foodstuffs, beverages, cosmetics, medicines and so on. Thus, we have industries like food processing industries, breweries, pharmaceutical industries, cement industries, petrochemical industries, textile industries and a host of others.

A greater percentage of the raw materials are obtained locally. The rest are imported. These industries have laboratories for their quality and quality control tests, development tests and other tests demanded by the nature of their work. This is sometimes done in collaboration with universities and research centres in the country.

An advanced knowledge of chemistry and other sciences and applied sciences is a prerequisite for personnel recruitment in these industries and this is usually acquired in our higher institutions: universities and polytechnics.

Universities here offer a 4-year first-degree programme in the chemistry and allied chemistry disciplines. Provision is also made for Masters and Doctoral programmes.

In the polytechnics, the programme is rather different and conducted in allied chemistry disciplines only. It consists of a 2-year Ordinary National Diploma (OND) programme and a 3-year Higher National Diploma (HND) programme which is a follow up of the OND programme. Some of the allied chemistry disciplines offered are: chemical laboratory technology, biochemistry, chemical education, and industrial chemistry. A basic knowledge of chemistry acquired from secondary school education is always a prerequisite for admission to these institutions.

I am a researcher and I own a new research centre with the name 'Uchenna Kanu Nature Exploration Kingdom – Arochukwu (UKNEKA). Our research is conducted in all science and applied science disciplines. I am currently furthering my education in the Department of Mechanical Engineering at the University of Nigeria – Nsukka. I also work in Dowell Schlumberger Nig. Ltd, Warri, Nigeria.

Uchenna Kanu
Affiliate Member
University of Nigeria
Nsukka Anambra State
Nigeria

Chemistry in Mongolia

IUPAC affiliate Dr Nansadyn Tsevegsüren is a research worker in the Department of Biochemistry at the Chemistry Institute of the Academy of Sciences of the Mongolian Peoples Republic. He is also Scientific Secretary of the Mongolian Chemical Society.

His research is concerned with analysis of fatty acids, triglycerides and fat-soluble vitamins present in the seeds of Mongolian plants. He hopes to attend the 34th IUPAC Congress to be held in Beijing in August 1993.

Dr Nansadyn Tsevegsüren

Information for affiliates

Have you returned your affiliate registration form?

Every affiliate receiving a copy of the May 1992 issue of *CI* should have found, inserted in the magazine, a white envelope addressed to affiliates. The envelope contained several documents including a red IUPAC affiliate membership registration form. This should be completed and returned to the IUPAC Secretariat before 31 October 31 1992.

The information on the form will be entered on to the IUPAC Affiliate Membership Computer Database. The database will be used to help promote the visibility of affiliates as potential recruits for the scientific work of IUPAC. In particular, names and addresses of affiliates expressing an interest in the work of a commission will be submitted to that commission early next year.

Increased discount for affiliates

IUPAC affiliates are entitled to a 40% discount on the price of the 1st Supplement to the 7th Edition of *Standard Methods for the Analysis of Oils, Fats and Derivatives* which was published in May this year. For details and a review of the supplement see page 188.

IUPAC publications

Affiliates are entitled to a 25% reduction and in some cases a 40% reduction on the cost of IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications has recently been distributed by the publishers to all *CI* readers. Further copies may be obtained from the IUPAC Secretariat.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 × 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC Programme on Chemistry and the Environment* have been distributed to members of IUPAC commissions and committees, national adhering organizastions and other bodies associated with IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Affairs Secretary.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2-3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK

Tel: +44 (865) 747 744
Fax: +44 (865) 747 510
Telex: 83147 VIA
OR G attn. IUPAC

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually – but not always – announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal

SCOPE leaflet

The Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) has published a small leaflet that concisely describes its aims, organization, products and scientific programme for 1992–95.

Copies of the leaflet are available from the SCOPE Secretariat, 51 bd de Montmorency, 75016 Paris, France. Tel: +33 (1) 4525 0498. Fax: +33 (1) 4288 1466. Telex: 645554 F ICSU. e.mail/omnet SCOPE. PARIS.

IUPAC ties and scarves

All IUPAC affiliates and members of IUPAC bodies are entitled to wear an official IUPAC tie or scarf. So why not wave the IUPAC flag when you attend a local, national, regional, or international meeting on chemistry?

Scarves are polyester head squares in red (wine-coloured) or dark blue (navy) with a yellow and white IUPAC logo in one corner. Ties are also polyester and are either dark red (maroon) or navy with a yellow and white logo.

To buy one or more ties or scarves please complete the order form below (or a photocopy of it) and send it with your cheque to the Affiliate Affairs Secretary at the IUPAC Secretariat.

You may pay either in US dollars (USD) or pounds Sterling (GBP). The prices include postage and packing.

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Commission & Committee News

Nomenclature of organic chemistry

The Commission on Nomenclature of Organic Chemistry (III.1) met unusually early this year. Scheduled to follow the historic Centenary Celebration of the Geneva Conference of Easter 1892 on Organic Chemical Nomenclature, it was held this year in the Park Montana Hotel, Oberhofen, overlooking Lake Thoune, from Saturday 25 until Friday 30 April instead of in late summer as is more usual. The attractions of this venue included stunning views across the lake to such peaks as the Eiger and the Jungfrau, and unusually warm, clear weather found some late afternoon working parties deliberating in the open air.

An exceptionally strong attendance of 30 past and present members may have owed as much to the locale as to the fact that some had attended the Geneva event, five as lecturers, and could get from there by car or train to Oberhofen in an afternoon.

The *Guide to IUPAC Nomenclature of Organic Compounds* (1991 Recommendations) (224 pp.) was given a final survey by the Editorial Committee with a view to submission for publication.

The *Glossary of Class Names and Reactive Intermediates Based on Structure* (March 1992) (75 pp.) prepared jointly with the Commission on Physical Organic Chemistry (III.2) was now circulated for review by referees.

Others, such as the Glossary of *Basic Terms used in Stereochemistry, Nomenclature of Fused and Bridged Fused Ring Systems*, Section F: *Natural Products and Related Compounds* were all taken a stage further and it was hoped that they would take advantage of the proposed new procedure by which Public Review would be roughly concurrent with that by IDCNS.

The Commission elected its new Chairman, Prof. Henri A. Favre of the University of Montreal and Vice-Chairman Prof. Henk J. T. Bos of the University of Utrecht. It re-examined its Terms of Reference in the light of recently acquired responsibilities at the Computer/Nomenclature Interface, and in the field of Student Publications on Nomenclature, as well as its areas of interaction and collaboration with other Commissions.

In the field of IUPAC-Preferred Name Nomenclature, working party reports indicated most promising progress at the start of a 5-year project aimed at publication of rationales designed to generate a unique preferred IUPAC name for an input structure. Valuable input was received from the computer specialists recently recruited to the Commission.

The free afternoon of Monday 27th saw most members deployed either on a nearly vertical excursion up a nearby alp or on a horizontal and aqueous trip on a lake steamer followed by a visit to the Caves of St Beatus. Whereas the climbing was mostly done by mechanical lifts, the caves proved to be accessible only after a taxing climb, the "20 minutes" proclaimed as the duration of the walk to the steamer being achieved only by the fittest members of the Commission.

Ted Godly (left) and Henri Favre who are respectively Secretary and Chairman of the Commission on Nomenclature of Organic Chemistry.

Most of the rest would have been hard put to it to cover such a distance on the level. However, the caves were very interesting and something like 700 litres per second of white water passing in close proximity to the pathway on its way to the waterfall at the exit provided an experience not readily forgotten. Next year in Lisbon, the General Assembly requires the Commission to convene at a more usual date.

E. W. Godly

Natural isotopic abundances

Stable isotopic reference materials of the light elements (H, Li, C, N, O, Si, S, etc.) are increasing in importance in environmental, geological, medical and hydrological studies. When Commission on Atomic Weights and Isotopic Abundances (II.1) Working Party on Natural Isotopic Fractionation met at Brookhaven National Laboratory, New York, on 17–19 March 1992, it agreed that a review of the isotopic compositions of such reference materials is timely. These reference materials are now distributed by NIST (National Institute of Standards and Technology) and the International Atomic Energy Agency, but isotopic compositions are not well known for many of these materials. Professor H. Roy Krouse, Chairman of the Working Party, pointed out that internationally accepted isotopic reference materials do not even exist for selenium and tellurium!

Light stable isotopic abundances are often expressed relative to a standard in parts per thousand enrichment or depletion (‰). This is the so called δ notation and the terms used for "‰" in the scientific literature include "permil", "per mil", "per mill", "per mille", or "ppt", depending upon the journal selected. With the expansion of isotopic data in the scientific literature, the Working Party concluded that agreement on a single term is beneficial. Further discussions are planned and a recommendation may be forwarded to IDCNS (Interdivisional Committee on Nomenclature and Symbols).

The Working Party discussed the preparation of a report showing the impact of the variation in isotopic abundance of compounds of 16 elements (H, Li, B, C, N, O, etc.) upon (i) atomic weight of that element, (ii) uncertainty in its atomic weight, and (iii) the isotopic composition of that element. One or two pages will be devoted to each element. Graphical presentation of extreme isotopic compositions of compounds of each element with axes for atomic weight, isotopic composition in atom percent, and standard d notation are planned. The Working Party plans to submit this report to *Pure Appl. Chem.* prior to the Lisbon meeting.

It was agreed that a second enhanced report documenting (i) isotopic fractionation mechanisms in the hydrosphere, biosphere and atmosphere, (ii) terrestrial isotopic variation, and (iii) isotopic composition of available reference materials would be undertaken. Further expansion for a third voluminous report was discussed; it would include isotopic fractionation in laboratory experiments as well as in the terrestrial environment. Theoretical calculations and experimental data would be included. This project would discuss applications in geochemistry, the physical sciences, biology, ecosystems, medical sciences, etc.

The next meeting of the Working Party will be held at the Lisbon General Assembly on 3 August 1993.

Tyler B. Copten

PAC Review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols, and technical reports appearing in *PAC* are published in *Chem. Intl.* in the section Recent Reports. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Organometallic chemistry

The March 1992 issue of *PAC* contains 15 plenary and invited lectures presented at the 6th IUPAC Symposium on Organometallic Chemistry Directed Toward Organic Symethesis (OMCOS-6) held in Utrecht, the Netherlands, August 1991. The proceedings of this symposium including these published lectures are reviewed separately in this issue of *Chem Intl.* by I. P. Beletskaya, Sh-I. Murahashi, A. Ricci and G. van Koten (see pages 175–179).

The March issue of *PAC* also contains a technical report from the Commission on Oils, Fats and Derivatives on the 'Determination of the phospholipid profile of lecithins by high performance liquid chromatography: Results of a collaborative study and the standardized method'. The abstract of the report is published in the section Recent Reports (see page 175).

Plasma chemistry

The 10th International Symposium on Plasma Chemistry, an IUPAC-sponsored conference held regularly every 2 years since 1973, was held in Bochum, Germany, on 4–9 August 1991. More than 450 participants from over 30 countries attended the meeting. A total of 396 contributions from 29 countries were accepted for presentation. These consisted of four plenary lectures, 24 invited lectures, 110 oral presentations and 258 poster presentations.

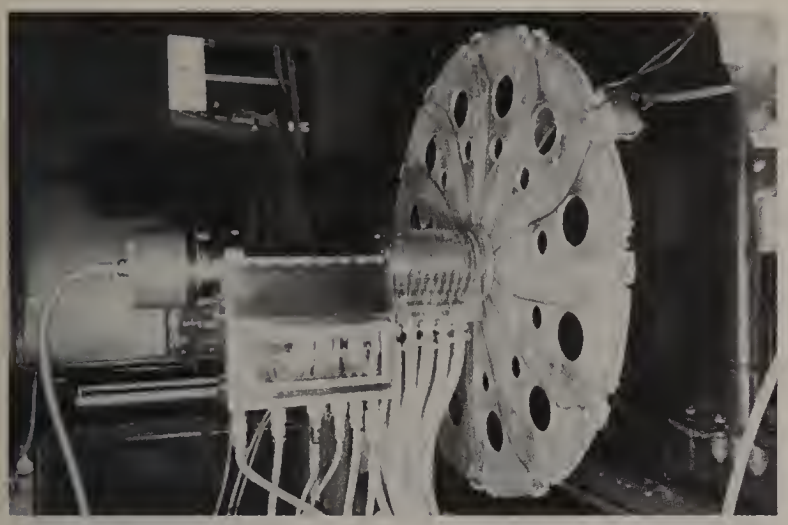
There were three sessions on the following topics:

1. *Thermal plasma*: Modelling and plasma generation; Diagnostics of therma plasmas; Plasma-substrate interaction; Materials processing; Chemical and metallurgical processing.
2. *Low-pressure plasma*: Modelling and diagnostics of low pressure plasmas; Plasma substrate interaction; Materials synthesis and polymerization; Inorganic and hard coatings; Surface characterization.
3. *Special topics*: Diamond and diamond-like coatings; Low-temperature atmospheric pressure plasma chemistry.

The May 1992 issue of *PAC* contains three plenary lectures and 21 topical lectures from the symposium. The plenary lectures are:

- Non-resolved problems of theoretical and applied plasmas chemistry (Leo S. Polak: Institute of Petrochemical Synthesis, Moscow, Russia);
- Non-equilibrium effects in thermal plasmas (Charles H. Kruger, Tom Owano, Matt Gordon and Christophe Laux; Stanford University, California, USA);
- Electron and mass spectrometric analysis of plasma controlled surfaces and thin films (Hans Oechsner, Universität Kaiserlautern, Germany).

The Section on Thermal Plasmas included a topical lecture on 'Plasma cutting in atmosphere and under water'. The paper, which was co-authored by W. Back and A. Gruchow (Universität Hannover, Germany), presented an overview of all kinds of plasma arc cutting techniques that are applied for practical purposes. For example, a plasma saw has been used for cutting stainless steel underwater. The saw consists of 12 plasma arc cutting torches arranged around a disk (see photo). Underwater plasma cutting is particularly useful in the shipbuilding and offshore oil industries and for decommissioning nuclear facilities.



Plasma saw.

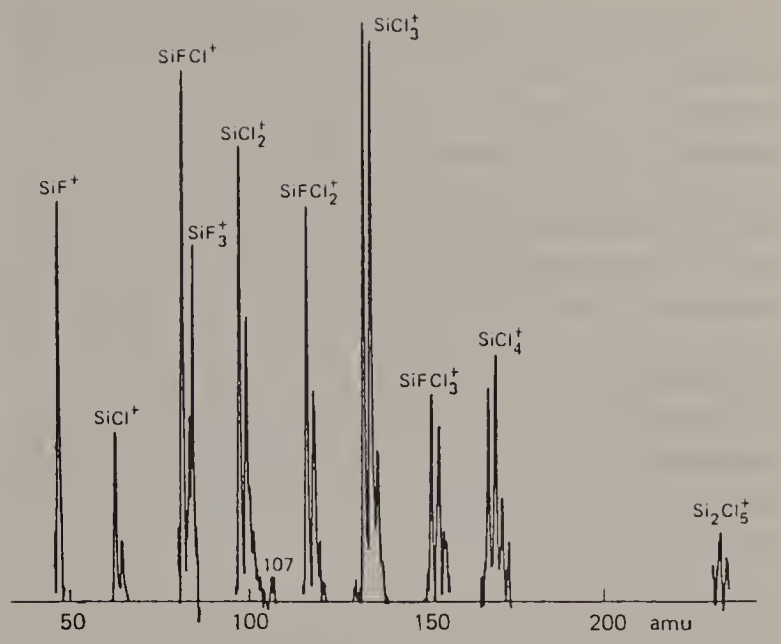
The Section on Low-Pressure Plasmas included a topical lecture by J. W. Coburn on 'Dual atom beam studies of etching and related surface chemistries.' Coburn pointed out that most surface science studies relating to plasma-assisted etching processes have been carried out using model systems in which clean surfaces in ultrahigh vacuum environments are subjected to controlled fluxes of reactive neutral species and energetic ions chosen so as to be representative of a plasma-assisted etching environment. This approach allows both control over the particle fluxes and *in-situ* surface characterization which are not easily achieved in a reactive gas plasma environment.

Most of these studies have involved stable reactive molecules such as XeF_2 or Cl_2. However, in a plasma process the key species are believed to be atomic or molecular radicals, often involving more than one halogen, halogen-hydrogen or other gas mixtures.

Whereas there have been some studies in which atom beams are directed onto surfaces, very little work has been reported involving two separate beams of reactive species. Recently, studies have been carried out in which various binary combinations of fluorine, chlorine and hydrogen atoms and/or molecules have been directed onto Si(111) and other surfaces with and without energetic ion bombardment. The gaseous species evolved from or reflected from the surface under study were monitored with modulated beam mass spectrometry (see figure). Coburn noted some interesting synergistic effects on Si(111) and some catalytic reactions on other surfaces.

Seiichiro Matsumoto and three co-workers from the National Institute for Research in Inorganic Materials, Tsukuba-shi, Japan, co-authored a paper on 'Diamond synthesis by thermal-plasma CVD (chemical vapour deposition). The paper was presented as a special topic at the Bochum symposium.

Their paper summarized the characteristics of thermal plasma methods for diamond synthesis and described the results of their attempts to increase deposition rate and to improve uniformity of diamond films. The use of alcohols instead of methane did not increase the deposition rate. They reported that deposition under substrate scanning mode improved film uniformity but was not good enough to produce high-quality diamonds. Positive substrate bias increased the deposition rate and the negative substrate bias changed crystal morphology to a great extent.



Products observed with a modulated beam mass spectrometer during the Ar^+ assisted etching of Si(111) with F_2 and Cl_2 molecules.

Electron spin echo spectroscopy

Plenary lectures presented at the International Society of Magnetic Resonance (ISMAR) Workshop on Electron Spin Echo (ESE) Spectroscopy were published in the June 1992 issue of *PAC*. This IUPAC-sponsored workshop was held in Novosibirsk, Russia, on 25–28 September 1991.

Professor Yu. D. Tsvetkov, Chairman of the Organizing Committee, writes in the preface to this issue of *PAC* that the aim of the workshop was to exchange ideas and information and discuss recent achievements and results in this rapidly developing field of radiospectroscopy. Three directions can be indicated where ESE, due to its peculiarities as the time domain spectroscopy, has considerable advantages over the continuous-wave ESR method:

- the study of weak spin–nuclear, spin–spin and exchange interactions by the analysis of ESE modulation effects;
- the study of the times of dipole–dipole (phase) and spin–lattice relaxation by analysis of the decay kinetics of ESE signals;
- the study of the kinetics of chemical reactions and accompanying magnetic phenomena in the time domain.

All these directions are being applied to a range of physical, chemical and biological problems; the definite progress made in the first of these directions is worth noting. Experimental and theoretical development of the Fourier spectroscopy based on ESE permits a novel direction in "high-resolution ESR spectroscopy" with application to such important areas as solid disordered systems.

In recent years, definite progress has been observed in the applications of ESE to studies of complex biologically important subjects, heterogeneous and photosynthetic systems and to the study of the rates and mechanisms of mobility in various matrices. The number of laboratories, using this method has increased, mainly due to the fact that ESE spectrometers have become commercially available. However, there are still many experimental and theoretical problems that demand the joint efforts of specialists in this field.

One of these, studied in detail in Novosibirsk, is with regard to the regularities of phase relaxation in diluted systems; however, a number of physical problems of this phenomenon remain to be resolved. Nevertheless, the progress in this direction offers wide opportunities for those who study chemical reactions in solids because the ESE method can be used to study in detail the spatial distribution of paramagnetic centres and its transformation during chemical reactions. One can expect a fairly wide range of applications for ESE spectroscopy here in due course, but so far this field has not developed as extensively as the Fourier ESE spectroscopy.

IUPAC affiliate R. B. Clarkson was one of a team of six scientists from the University of Illinois, USA, who contributed a paper on 'S-band electron spin echo spectroscopy' at the workshop. The paper reported that in order to explore the advantages of multi-frequency ESE experiments, the team has constructed a pulsed EPR spectrometer operating over a microwave frequency range of 2–4 GHz (S-band).

The team observed dramatic enhancement of ESE envelope modulation (ESEEM) depth for weakly coupled nuclei. Well-defined resonance peaks corresponding to nearly pure NQR frequencies were observed for ^{14}N in some nitroaromatic systems, at values of B_o near "exact cancellation" and more distant from the cancellation condition than had been predicted. In the case of nitrogen modulation in a copper(II) complex with large *g* anisotropy, the Illinois team achieved strong orientation selection at S-band as well as X-band.

Novosibirsk Akademgorodok was the venue of the ESE Spectroscopy Workshop.

Another IUPAC affiliate who contributed to the Novosibirsk Workshop was Larry Kevan from the University of Houston, Texas, USA. He presented a plenary lecture on 'Applications of electron spin echo modulation to transition metal ions in smectite clays'. The paper reported the determination of the location and solvation environment of copper(II) ions and silver atoms in non-pillared montmorillonite, beidellite and hectorite clays by ESE modulation spectroscopy.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomennclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *Chem. Intl.* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of the national/regional centres appeared in *Chem. Intl.* **14**, 25 (1992).

Nomenclature of inorganic chain and monocyclic compounds

The "Nomenclature of Inorganic and Chain Compounds" is based on additive nomenclature and thus does not require any prior knowledge about the nature of bonds between the atoms. Although the method can be applied to all compounds, its use is mainly intended for inorganic compounds which are mainly composed of atoms other than carbon.

A neutral chain compound is called a "catena" and a neutral monocyclic compound a "cycle". The corresponding cations are called "catenium" and "cyclium" and the anions "catenate" and "cyclate". The number of atoms in the chain or in the ring is given by an indicator [*n*] placed immediately before the term "catena" or "cycle" and preceded by a hyphen.

Specific rules are provided for the selection and numbering of the principal chain or ring in the molecules. The elements which constitute the principal chain or ring are listed in alphabetical order complete with their locants and are named modifying the element radical names given in Table V of *Nomenclature of Inorganic Chemistry* by substituting the terminal "-io" by "-y". All atoms (including hydrogen) or groups of atoms which are not a part of the principal chain or ring are named as ligands. They are also named in alphabetical order before the cited sequence of the chain or ring atom terms. In the case of some group 14 elements with hydrogen ligands it is permissible to use so-called "core hydrogen containing units".

Comments on the document are welcome and should be sent by 31 May 1993 to: Prof. E. Fluck, Gmelin-Institut für Anorganische Chemie und Grenzgebiete der Max-Planck-Gesellschaft, Carl Bosch Haus, Postfach 900467, Varrentrappstrasse 40-42, D (W) -6000 Frankfurt/Main 90, Federal Republic of Germany.

Organometallic chemistry

This report by I. P. Beletskaya[a], Sh-I Murahashi[b], A. Ricci[c] and G. van Koten[d] reviews the current state of organometallic chemistry. It is based on the proceedings of OMCOS-6.

The 6th IUPAC-sponsored International Symposium on Organometallic Chemistry directed towards Organic Synthesis (OMCOS-6) was held on 25–29 of August 1991 at Utrecht, the Netherlands. It was organized by the University of Utrecht under the chairmanship of Prof. Gerard van Koten. A total of 632 participants from 36 countries (106 participants from the host country, and 526 from abroad) took part in the discussions. The scientific programme included six plenary lectures of 1 hour each, nine 30-minute lectures, twenty 20- minute invited lectures, and 294 posters. There were also 17 short 10-minute oral presentations that were delivered in two non-overlapping minisymposia.

In this short report our goal is to study the main trends in the area covered by OMCOS conferences, and these can be very clearly seen in the work presented at the most recent conference of the series in Utrecht.

Catalysis

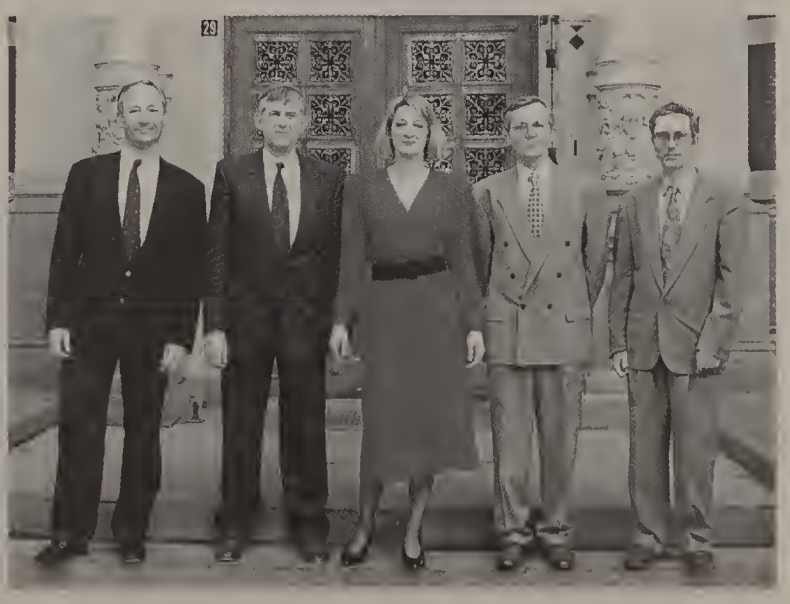
The use of transition metal complexes as catalysts for building carbon-carbon and carbon-element bonds is undoubtedly the main area of research discussed at OMCOS conferences. The last decades have produced an enormous stock of synthetic methods exploiting this strategy, and now the trend is to apply these methods to solve more and more complex synthetic challenges. The lectures of synthetic chemists B. Trost on "Atom economy via transition metal catalysed reactions", and Y. Kishi "Application of Ni(II)/Cr(II) mediated coupling reactions to natural product synthesis" were expositions of the potential of the use of transition metal complexes in catalysis applied to natural products synthesis.

A great variety of approaches to cyclization, heterocyclization, polycyclization, and annelation with the aid of palladium catalysis was discussed by Ei-ichi Negishi, J. -E. Backvall, R. Larock, and F. E. Meyer. The versatility of palladium catalysis was demonstrated by J. Salaun in the nucleophilic substitution in cyclopropanes, M. Tanaka in the insertion of acetylenes across Si–Si bonds in polymers, and by I. P. Beletskaya in showing that the palladium catalysed reaction of C–C bond formation can be successfully carried out in water.

The synthetic might of palladium complexes were widely exhibited both at the minisymposium "Metals in Catalysis", and in a multitude of poster communications. The presented methods ranged from the oxidation of secondary alcohols to ketones and the exhaustive reduction of aromatic rings by formic acid, to the carbonylation of N-chlorosulfonamides to isocyanates and ureas, [1+2] and [3+2] cycloaddition, allylic rearrangements and substitution. Palladium complexes can be used for the synthesis of methylenecyclopentanes, indoles, quinolines, lactones, tetrahydropyridines, and thieno [3,4-b] thiophene. Palladium catalysis is successfully used for synthesis of important bioactive materials: herbicides, pesticides, vitamins, hormones, antibiotics, C-arylglycosides, and other pharmaceuticals.

Nickel complexes are also useful and versatile catalysts: ylide complexes of nickel have been used in polymerization, and synthesis of bicyclic structures with simultaneous carbannelation was achieved using $Ni(CO)_4$. Nickel complexes either with simple 1,3-diketonates, or with their polydentate macrocyclic analogues effectively catalyze olefin epoxidation (with turnovers of up to 1 000 000); nickel, palladium, and cobalt induce cyclization of alkynes with trimethylsilyl cyanide giving pyrroles.

Catalysis by copper complexes remains an active area of research, which was discussed at the second minisymposium and in many posters. Oral presentations considered copper salts catalysis of the cross-coupling of nitroarenes with aromatic halides, the stereocontrolled formation of allenes in the reactions of organocuprates with functionalized alkynes, and a novel method for the synthesis of α-aminoacids through the cuprous chloride catalysed addition of α-chloroglycines to alkenes and alkynes. Various compounds



OMCOS-6 Local Organizing Committee (from left): Prof. G. van Koten (Chairman), Dr J. Boersma, Ms G. E. Schreurs, Dr D. M. Grove and Mr J. T. B. H. Jastrzebski.

[a] I. P. Beletskaya: IUPAC Representative at OMCOS-5 and 6 and President of the Organic Chemistry Division 1989–91.
[b] Sh-I. Murahashi: Chairman of OMCOS-7 (to be held in Kobe, Japan, 1993).
[c] A. Ricci: Chairman of OMCOS-5 (Florence, Italy, 1989).
[d] G. van Koten: Chairman of OMCOS-6 (Utrecht, the Netherlands, 1991).

Prof. Irina Beletskaya (Lomonosov Moscow State University) was IUPAC Official Representative at OMCOS-5 and OMCOS-6.

of copper (from zero- to trivalent) catalyse cyclotrimerization of nitrites to 2,4-diaminopyridines, benzoyloxylation of olefins, alkoxylation of aryl chlorides, aminolysis of bromoallenes to propargylamines, and hydrogenation of α,β-enones.

Poster sessions presented abundant examples of catalysis by both simple and esoteric complexes of other metals used for carbonylation of olefins, alcohols, and nitrocompounds (Ru, Rh complexes), hydroformylation (Rh, Pt/Sn, Ru) silylcarbonylation of propargylamines opening a route to α-methylen-β-lactams (Rh), hydrogermylation, hydroboration (Rh), as well as some variations of the latter, cyclopropanation (Ru), cyclization (Co), and heterocyclization (Ru), [4+2]-cycloaddition (Ti/Al) cyclotrimerization (Ti/Al) oxidation of alcohols (Ru), and selective reduction of nitrocompounds (Ru, Rh). Along with the modification of now classic rhodium catalysts for hydrogenation, new catalytic systems are also being developed, for example thienyltitanocenes; zirconocenes turn out to be excellent regioselective catalysts for hydrosilylation.

Reagents

Transition metal complex reagents are becoming increasingly important in modern organic synthesis. Intramolecular activation of CH bonds via cyclometallation, preparation of iron tricarbonyl complexes of vinylketenes, vinylketenimines, and vinylallenes and the use of these reagents in synthesis, the synthesis and reactivity of vinyl substituted η^5-dienyl complexes, new uses of iron carbene complexes are all topics that belong here.

Stoichiometric reactions with both σ- and π-bonded organometallic reagents were widely represented in poster sessions and minisymposia. We may only enumerate such works as cycloaddition, insertion into C–M bonds, chemistry of metallacycles and cyclometallation, cyclopalladation as a method of selective functionalization and the synthesis of carbocycles. Cyclometallated derivatives of iridium, zirconium, titanium, which have become available, open new synthetic possibilities. Tricarbonylmetal arene complexes (metal = Cr, Mn, Fe) are extensively used in syntheses, since the $M(CO)_3$ groups perform both activating and stereocontrolling roles in such processes as substitution and addition, cyclization, and ring opening. Recently, such complexes have been produced with heteroaromatic ligands including pyridines and thiophenes. Synthetic uses of alkene and alkyne complexes have also been explored. Zirconocenes are worth mentioning as reagents in the synthesis of sophisticated (and often naturally occurring) molecules.

Selectivity

Chemo-, regio-, and stereoselectivity is the key aim of syntheses with transition metal complexes. However, the growing need for pure enantiomers is leading to the next step – enantio- and diasteroselective transformations. The search for new approaches in assymmetric synthesis is one of the brightest trends in OMCOS.

The most impressive achievements in the synthesis of pure enantiomers are associated with catalysis by chiral complexes of transition metals. Only in catalytic procedures can the expensive chiral molecules be efficiently used in small quantities, thus providing multiple chirality transfer from a single catalyst molecule to thousands of molecules of product. This area of research was adequately represented in the symposium proceedings - a major part of the presented research on asymmetric synthesis dealt with catalytic reactions with chiral catalysts.

In recent years, Ru is steadily displacing Rh from enantioselective catalysis, where the latter has been traditionally prevailing. An immense variety of Ru complexes are being investigated as catalysts: octahedral carboxylate, η^3-allylic, η^6-arene complexes for the hydrogenation of various substrates; mono- and dihydrido complexes for transfer hydrogenation. Rhodium-catalysed hydrogenation, hydroformylation, and hydroboration reactions are being refined either by adjustment of chiral ligands, or even by a simple optimisation of reaction conditions. An example of the latter approach was given by J. G. De Vries, who has considered the influence of not only the nature of substrate and commercially available disphosphines, but also of such parameters as solvent and hydrogen pressure on the efficiency of Rh-catalysed hydro-generation of N-benzylamines.

In striking contrast to achiral catalysis, enantioselective Pd-catalysed reactions attracted an undeservedly meagre share of symposium reports, represented by asymmetric cross-coupling, and the reactions with π-allylic intermediates. A lecture by J. Salaun, which referred to the synthesis of optically active cyclopropylidene derivatives via the palladium-catalysed nucleophilic substitution of alkenyl and alkylidene cyclopropanes, is additionally interesting in the promptness with which new synthetic methods are being investigated and utilized for enantioselective processes. The most impressive achievement in Pd-catalysed enantioselective reactions is probably the development of asymmetric arylation of olefins by aryl triflates, considered in the report by T. Hayashi. It is a rare example of asymmetric Heck reaction, and the first example of an asymmetric intermolecular Heck type C–C bond formation.

Complexes of other transition metals have more narrow uses: Pt/Sn catalysts are traditionally employed for hydroformylation, Mo complexes are used for epoxidation and epimerization of aldoses, while iron porphyrins catalyse the oxidation of sulfides. A good example of the use of chiral Lewis acids was given in a lecture by G. Erker, in which a

complex $ZrCl_3^+$ with an optically active diborna-cyclopentadienyl ligand was found to be an efficient catalyst for the enantioselective hydroxyalkylation of aromatic substrates.

Enantioselectivity of transition metal catalysis depends in the first place on the source of chirality, that is on the optically active ligand. The design of new chiral ligands is becoming more and more aimed at the achievement of the required chemical or structural parameters: sulfonation of the commercially available diphosphines makes water-soluble ligands, and the preparation of chiral diphosphines with wider bite angles, as well as of lipophilic N,O-donor ligands has been achieved. However, the most fruitful idea in the design of chiral ligands (and chiral auxiliaries in the stoichiometric asymmetric synthesis) is the use of the overall C_2 symmetry of ligands or axially dissymmetrical fragments. This idea has produced the classical diphosphine ligand Binap (useful in almost every Ru-catalysed process), as well as novel ligands. Some examples include a chiral C_2-symmetric zirconocene-alumoxane catalyst used for isotactic polymerization of propene, and a chiral macrocyclic complex of Co(III), that is a synthetic analogue of cobyrinic acid.

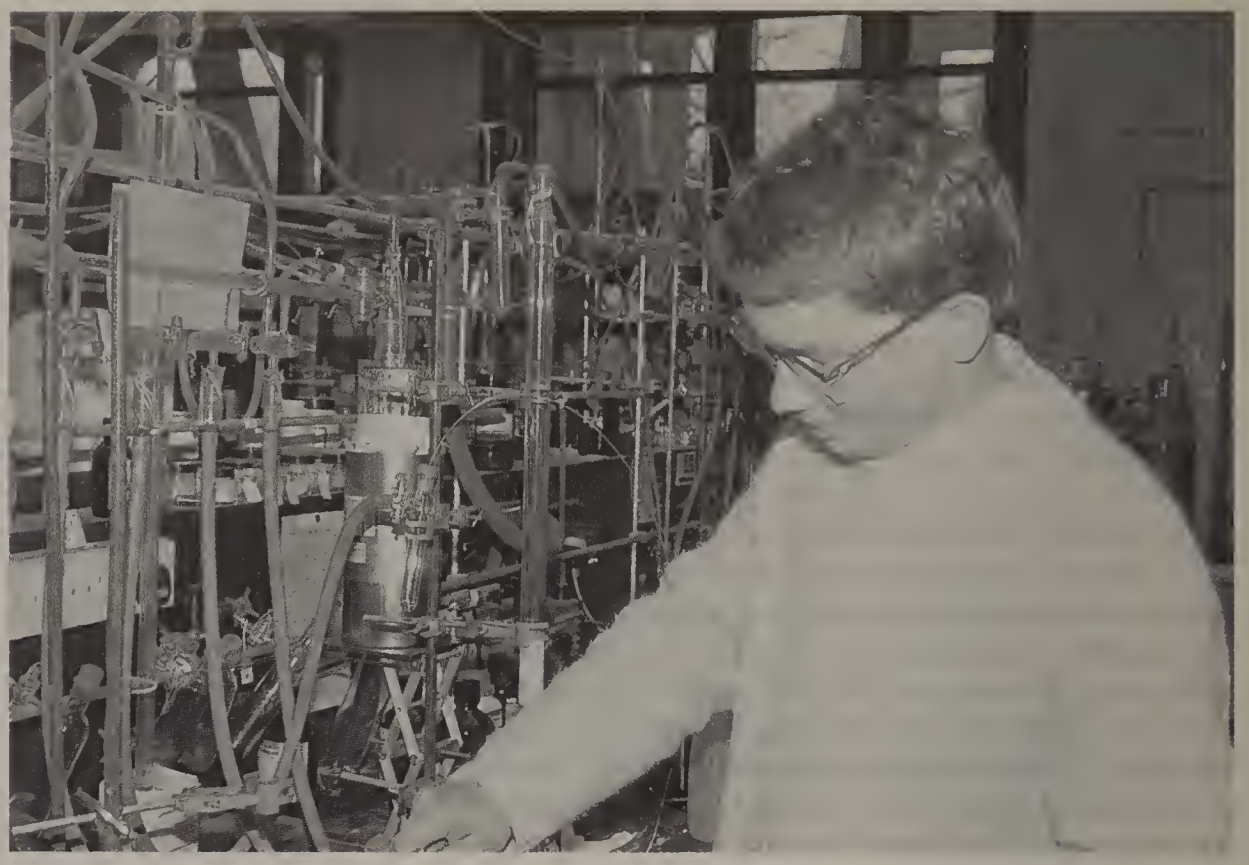
A chiral Lewis acid–alkoxide complex of Ti(IV) with the dissymmetric diol Binol provided a highly stereocontrolled ene-reaction with glyoxylate, and other processes (Diels-Alder and hetero D/A reactions); a new monodentate phospholane ligand and a β-ketophosphonate with binaphthol and camphor fragments have been synthesized. The latter compound successfully combines an axial dissymmetry of the ligand with ready availability of the chiral label. The same principles are used for the design of a series of C_2-symmetric bis-oxazoline ligands with a 1,2-phenylene or a pyridine-2,6-diyl skeleton. The efficiency of the latter ligands was demonstrated in the report by H. Nishiyama, that was devoted to the enantioselective Rh-catalysed reduction (via hydrosilylation) of ketones. Axial dissymmetry works equally well in stoichiometric reactions with chiral auxiliaries.

The search for synthetic analogues of active sites of enzymes is among the aims of the biomimetic approach to enantioselective catalysis. The advantage of such an approach is the possibility to use both enantiomers of the catalyst and, therefore, to prepare both enantiomers of the product. The biomimetic approach can be understood more broadly through the use of common principles of enzymatic catalysis – proximity and proper orientation of reagents, restriction of conformational flexibility etc. – rather than through the direct mimicking of active sites. The other branch of biomimetics tries to reproduce enzymatically catalysed processes with organometallic or even inorganic compounds. An impressive contribution to this field was presented in the report by S.-I. Murahashi to mention only the diastereo selective Ru-catalysed oxidation of azetidinones, important for the synthesis of carbapenem and thienamycin.

To conclude our analysis of the main trends in enantioselective catalysis, the advantages of asymmetric reactions with a positive non-linear effect are to be noted. Such processes are undoubtedly of practical interest, since here the difference of catalytic and stereodifferentiating activity between meso- and racemic forms of the catalyst turns into "asymmetric amplification", whereby the products of high optical purity can be produced with partially resolved catalysts. Such nonlinear effects have been established by K. Mikami for carbonyl-ene reactions catalysed by Ti(IV) chiral alkoxides, for conjugate addition of Et_2Zn to α,β-unsaturated carbonyl compounds catalysed by $Ni(acac)_2$ adducts with chiral pyridine ligands, as well as for Rh-catalysed hydroboration.

Stoichiometric diastereoselective processes, along with those reactions catalysed by achiral complexes but which are controlled by either a chiral substrate (this is particularly

OMCOS-5 was held in Florence, 1989, under the Chairmanship of Prof. Alfredo Ricci (top right).



The search for synthetic analogues of active sites of enzymes is among the aims of the biomimetic approach to enantioselective catalysis.

advantageous for syntheses based on naturally occurring optically active compounds) or a chiral reagent make an important branch of assymmetric synthesis. As examples one may cite novel chiral azaborolidines used for catalytic hydroboration, diethyltartrate complexes of Ti(IV) available for stoichiometric oxidation of thioethers, chiral organolithium, magnesium, and zinc reagents, alkylcuprates, chiral aminoenolates of zinc, which showed a reasonable efficiency. In the reactions of organic substrates with optically active auxiliaries optical yields of 90%ee or higher are now common. High diastereoselectivity has been observed in the reactions of chiral 2-acyl-1,3-oxathianes with organolanthanide compounds (e.g. alkynylytterbium chloride) by K. Utimoto: it is worth mentioning that asymmetric induction in these processes has an opposite sign to that found in the reactions with organolithium compounds and Grignard reagents.

The template synthesis with arenes π-coordinated to a tricarbonylmetal group in complexes with planar chirality is an important type of diastereoselective stoichiometric reaction. There is a great variety of such reactions including those with electrophiles and nucleophiles, cycloaddition, etc. The preparation of β-lactones with high optical purity by such a method is of extreme importance. An example of the use of planar chirality of tricarbonylchromium complexes for the stereocontrol of benzyl sites can be found in the report by S. G. Davies – the cyclization of homoallyl alcohols obtained via π-coordinated acetals of ortho-substituted aldehydes opens a route to 2-aryl-substituted tetrahydropyranes by fully stereocontrolled formation of the three adjacent asymmetric centers. Chiral zirconoxycarbenes can serve as a template for the synthesis of carboxylic acid derivatives.

An example of another type of stereocontrol in diastereoselctive template synthesis is contained in the report by J. W. Faller devoted to the reactions of π-allylic semi-sandwich Mo complexes (in which the metal atom is the center of chirality) with aldehydes – stereochemistry of reaction products, homoallyl alcohols, is completely determined by the bsolute configuration of metal center, even in the case when chiral aldehydes are used. One more variation of the template synthesis was discussed by F. Bigi; intramolecular regio- and stereocontrol in electrophilic aromatic substitution (Friedel–Crafts reaction) is realized within a complex with phenolate and chiral glyoxilate ligands – the method affords ortho-hydroxysubstituted mandelic acids of high optical purity.

Non-transition metals

The material presented during OMCOS-6 reveals that the chemistry of non-transition metals is gaining a new dimension. M. T. Reetz has outlined breath-taking perspectives (including stereoselective syntheses) of a new generation of Grignard reagents. Polyfunctional organozinc compounds are readily available and are versatile precursors of cuprates, obtained by their reaction with CuCN·2LiCl. A novel powerful strategy of the synthesis of polyfunctional molecules via the addition of silyl and stannylcuprates to C...C and C=X bonds has been developed by A. Ricci. Poster sessions included results on the synthesis of new organometallic reagents, for example, nonpyrophoric methyllithium and stabilized methylcuprate, activation of organomagnesium and organozinc reagents by crown-ethers, new chemoselective organoboron reagents, allylboranes, organometallic substituted alkenylboranes, polypyrazolylborates of U(III), sophisticated organolithium and organosilicon reagents, and mixed stannylcuprates. New synthetic capabilities of organotin and organobismuth compounds were disclosed.
Organolanthanide compounds have not been left unnoticed. Besides the above-mentioned work, a report of the synthesis and reactivity of benzyl- and allyl samarium complexes was given by J. Collins.

Various practical uses of organometallic compounds, as well as conventional coordination were discussed in many posters.

Problems of the Environment

Recent SCOPE reports have focused on biogeochemistry of rivers, stable isotopes, genetically modified organisms, ecosystems, exposure to chemicals in the environment, and long-term ecological research.

SCOPE (Scientific Committee on Problems of the Environment) is one of a number of committees established by the nongovernmental group of scientific organizations, the International Council of Scientific Unions (ICSU). The membership of ICSU includes representatives from 75 National Academies of Science, 20 International Unions (including IUPAC), and 29 other bodies called Associates.

To cover multidisciplinary activities which include the interests of several unions, ICSU has established 13 Scientific Committees, of which SCOPE is one. Currently representatives of 35 member countries and 21 Unions, Scientific Committees and Associates participate in the work of SCOPE, which directs particular attention to the needs of developing countries. SCOPE was established in 1969 in response to the environmental concerns emerging at the time: ICSU recognised that many of these concerns required scientific inputs spanning several disciplines and ICSU Unions. SCOPE's first task was to prepare a report on Global Environmental Monitoring (SCOPE 1, 1971) for the UN Stockholm Conference on the Human Environment.

The mandate of SCOPE is to assemble, review and assess the information available on man-made environmental changes and the effects of these changes on man: to provide an intelligence service on current research: and by the recruitment of the best available scientific information and constructive thinking to establish itself as a corpus of informed advice for the benefit of centres of fundamental research and of organizations and agencies operationally engaged in studies of the environment.

Biogeochemistry of major world rivers

The value of water as a natural resource has been underestimated by successive generations of people throughout the world. Water is taken for granted in many parts of the developed world and its scarcity in the developing world is only recognized at times of extreme hardship. The impact of a growing world population on ground waters, rivers and lakes is apparent from the progressive increase in pollutants in our fresh water reserves, and these pollutants ultimately find their way into the sea.

Ten years ago, an ambitious project entitled 'Transport of carbon and minerals in major world rivers' was begun with the help of SCOPE and the United Nations Environment Programme (UNEP). The aim of this study was to assess the discharge by rivers into world oceans of organic matter (both dissolved and particulate), nutrients and minerals.

SCOPE Report 42 *Biogeochemistry of Major World Rivers* synthesizes the mass of data which has been gathered by scientists around the world. It provides the first overview of the biogeochemistry of major rivers and their role in the biogeochemical cycles of the biosphere. Scientific analyses include spatial variability, remote sensing and chemical analysis. A major case study of the biogeochemistry of the Amazon is presented, and similar studies of other major rivers are also included.

SCOPE Report 42: Biogeochemistry of Major World Rivers *is edited by Egon T. Degens, Stephan Kempe and Jeffrey E. Richey and published by John Wiley & Sons, Chichester, UK, 1991. xxiv + 356 pp. ISBN 0 471 92676 0. Price GBP 85.00/ USD 195.00.*

SCOPE 42 provides the first overview of the biogeochemistry of major rivers and their role in the biogeochemical cycles of the biosphere.

Stable isotopes

SCOPE Report 43 is entitled *Stable Isotopes: Natural and Anthropogenic Sulphur in the Environment*. The book addresses the important question of differentiating natural and anthropogenic sulfur in the environment. International experts explain how stable isotopes of sulfur and oxygen have been used to study the origin and transformations of sulphur in ecosystems.

The topic is treated in logical sequence with the first two chapters providing an overview of the basic principles of sulfur and oxygen isotope research. The third chapter reviews experimental techniques. Subsequent chapters are devoted to the lithosphere, atmosphere, hydrosphere, pedosphere, and biosphere. In the final chapter, investigators relate how they have successfully applied, or plan to apply, stable isotope techniques to study sulfur in a variety of ecological systems throughout the world.

The book is the outcome of a workshop of the Sulphur Unit of UNEP.

SCOPE Report 43: Stable Isotopes: Natural and Anthropogenic Sulphur in the Environment *is edited by H. R. Krouse and V. A. Grinenko and published by John Wiley & Sons, Chichester, UK, 1991. xxv + 440 pp. ISBN 0 471 92646 9. Price GBP 65.00/USD 138.30.*

Genetically modified organisms

There has been a continuing concern regarding the potential consequences of the release of genetically engineered organisms into the environment. SCOPE Report 44 *Introduction of Genetically Modified Organisms into the Environment* first views the history of concerns regarding genetic manipulation in general and then examines the genetic, population, and ecological dimensions of the release issue. Finally, approaches to assessing risks and setting safety standards are given.

The overall view is international in scope and brings together a variety of disciplinary approaches to the problem. A principal conclusion of the book is that the environmental introduction of any organisms, modified or unmodified, should be undertaken within a framework that maintains appropriate safeguards for the protection of environmental and human health while not discouraging innovation.

SCOPE 44 is the outcome of a meeting to consider these issues, attended by specialists in molecular biology, population genetics, and ecology. The meeting was held in Bellagio, Italy and was sponsored by SCOPE and the Scientific Committee on Genetic Experimentation (COGENE).

SCOPE Report 44: Introduction of Genetically Modified Organisms into the Environment *is edited by Harold A. Mooney and Giorgio Bernardi and published by John Wiley & Sons, Chichester, UK, 1990. xx + 201 pp. ISBN 0 471 92677 9. Price GBP 55.00/USD 118.00.*

Ecosystem experiments

Predicting the consequences of ecosystem changes is a formidable challenge. Historical information does not provide all the answers and simulation models, although enormously revealing, may be misleading. A third approach is experimental manipulation of whole ecosystems. Such experiments can tell us how whole systems, as well as their components, will respond to change both in the short and long term, as well as providing direct tests for simulation models.

The objective of SCOPE Report 45 *Ecosystem Experiments* is to explore the potential of ecosystem experimentation as a tool to understanding and predicting more precisely the consequences of our changing biosphere. A broad view is taken of the problem by first examining what has been learnt from 'natural' experiments as well as large-scale inadvertent ecosystem perturbations induced by human action.

The book reviews past work as well as proposing priorities for future research for the study of both terrestrial and aquatic ecosystems utilizing experimental approaches.

SCOPE Report 45: Ecosystem Experiments *is edited by Harold A. Mooney, Ernesto Medina, David W. Schindler, Ernst-Detlef Schulze and Brian H. Walker and published by John Wiley & Sons, Chichester, UK, 1991. xxvi + 268 pp. ISBN 0 471 92926 3. Price GBP 60.00/USD 127.65.*

Exposure of human and non-human biota

Assessment of exposure to chemicals in the environment is a highly complex undertaking. Estimates of exposure are required in order to assess the risk of chemical contamination. SCOPE Report 46 *Methods for Assessing Exposure of Human and Non-human Biota* approaches the problem of exposure in three ways:

1. the evaluation of exposure through consumption of food, water or air;
2. the movement and possible alteration of chemicals from the source to the point of exposure;
3. analysis of exposed tissues.

Many key issues are analysed in depth and numerous recommendations are made.

The evaluation of exposure to chemicals through consumption of food, water or air is one of the topics considered in SCOPE 46.

The book will be of interest to experts engaged in dealing closely with the problems of exposure assessment and of risk assessment, and also to those who are called upon to advise national agencies on the strategy for the prevention and control of exposures to chemicals and by those who are responsible for the development of chemical safety programmes world-wide.

SCOPE Report 46: Methods for Assessing exposure of Human and Non-human Biota *(IPCS Joint Symposia 13 SGOMSEC 5) is edited by Robert G. Tardiff and Bernard D. Goldstein and published by John Wiley & Sons, Chichester, UK, 1991. xxiv + 417 pp. ISBN 0 471 92954 9. Price GBP 85.00/USD 185.85.*

Long-term ecological research

Long-term Ecological Research: An International Perspective (SCOPE 47) reviews important long-term ecological research programmes in several countries throughout the world and identifies problems associated with changing global environments. The chapters both describe and analyse successful research programmes in various ecosystems, including temperate forests, temperate and tropical grasslands, arid steppes, deserts and aquatic systems from countries such as Australia, Canada, England, Germany, France, Kenya, Scotland and the United States.

In each case, the characteristics that make the programmes successful are evaluated. Other topics such as administrative structure, role of sites, conceptual design, field management techniques and modelling in the context of long-term ecological research are also discussed.

The volume then describes specific future ecological questions that can only be answered by long-term studies and proposes the necessary organizational structure and communication networks required for multi-national, long-term ecological research programmes.

SCOPE Report 47: Long-term Ecological Research: An International Perspective *is edited by Paul G. Risser and published by John Wiley & Sons, Chichester, UK, 1991. xvi +294 pp. ISBN 0 471 93005 9. Price GBP 69.00/USD 146.80.*

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC.*

Cooperative study on measurement of concentrations of selenium in freeze-dried (human whole) blood (Technical Report)

A cooperative study was conducted under the auspices of the IUPAC Commission on Toxicology to measure total concentrations of selenium in three lots of commercially available freeze-dried human whole blood (Seronorm, NyocoMed A/S, Norway). A serum material already examined in two previous studies was simultaneously distributed to assess accuracy of the analytical procedures better.

A total of 39 laboratories from 15 countries participated in the trial using seven inherently different methods: acid decomposition-fluorimetry (ADF); electrothermal atomic absorption spectrometry (EAAE); acid digestion-hydride generation/atomic absorption spectrometry (ADHG-AAS); proton-induced X-ray emission (PIXE); instrumental neutron activation analysis (INAA) or instrumental activation analysis with radiochemical separation (RNAA); energy dispersive X-ray-fluorescence spectronomy (EDXRF) and acid digestion-isotope-dilution mass spectronometry (ADIDMS)

The performance of the different analytic methods was critically assessed. For serum, all laboratories using PIXE, RNAA and EDXRF had to be excluded in the final estimation as well as two of the three laboratories using INAA. For whole blood too, laboratories applying PIXE and RNAA had to be excluded, but performances for INAA were acceptable. Better agreement and satisfactory variance components were found between other methods and the exclusion rate was considerably lower.

The following mean concentrations [±68% confidence intervals for one future observation] were established for whole blood: Batch 904, 96.4±4.4 μg/L; Batch 905, 97.5±5.1 μg/L; Batch 906, 96.0±4.4 μg/L. The concentrations in these materials were similar to those found in population studies in most European countries. The material is suitable as quality assurance material for the measurement of typical concentrations of selenium in blood.

This report was prepared for publication by J. Nève, Y. Thomassen and M. van Damme, Subcommittee on Harmonization and Quality Assurance; Commission on Toxicology, Clinical Chemistry Division, and published in Pure Appl. Chem. ***64*** *(5), 765–780 (1992).*

Reporting of nitrogen-isotope abundances (Technical Report)

To eliminate possible confusion in the reporting of nitrogen-isotope analyses, the Commission on Atomic Weights and Isotopic Abundances recommends that the value 272 be employed for the $^{14}N/^{15}N$ value of N_2 in air for calculating atom percent ^{15}N from measured $\delta^{15}N$ values.

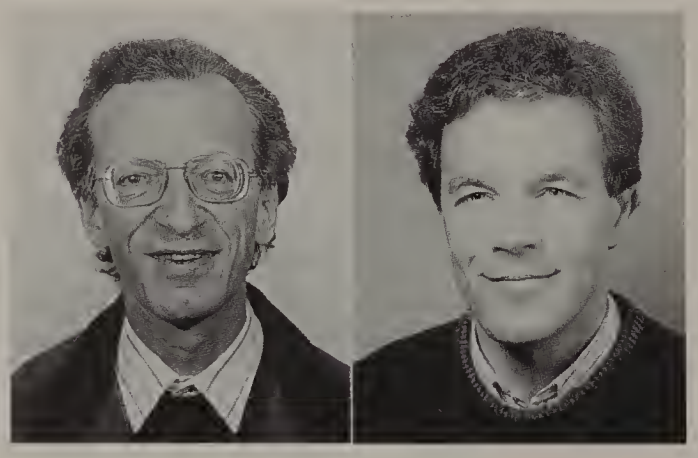
This report was prepared for publication by T. B. Coplen, H. R. Krouse ansd J. K. Böhlke, Commission on Atomic Weights and Isotopic Abundances, Inorganic Chemistry Division, and published in Pure Appl. Chem. ***64*** *(6), 907–908 (1992).*

Environmental Particles

The recently published monograph *Environmental Particles* (Volume1) is part of a project of the IUPAC Limited Life Time Commission on Environmental Analytical Chemistry. It is the first volume in the new IUPAC Environmental Analytical and Physical Chemistry Series.

Introduction

Environmental Particles is a project of the IUPAC Limited Life Time Commission on Analytical Chemistry. The first volume was published earlier this year. Publication of the second volume is expected next year sometime before the IUPAC General Assembly in Lisbon. The editors of the these volumes are Jacques Buffle[a] and Herman P. van Leeuwen[b]. The following account of the series and Volume 1 is based on Buffle's preface to Volume 1 and the foreword by both Buffle and van Leeuwen.



Jacques Buffle (left) and Herman P. van Leeuwen who are respectively Chairman and Secretary of the IUPAC Limited Lifetime Commission on Environmental Analytical Chemistry.

Environmental analytical and physical chemistry series

Buffle writes in the preface to Volume 1 that until recently the concern of most environmental scientists has been focused on air and water quality engineering and the development of analytical techniques limited to pollution control applications. In addition, the processes used for air and water quality improvement were often based on empirical grounds or on theoretical concepts, founded on oversimplified model systems, which are difficult to relate to real environmental ones.

In the early sixties a small number of scientists had already realized that environmental science has its own specificity, based on principles which must be studied and understood on rigorous grounds to allow the development of novel engineering and meaningful analytical measurements. But it is only during the last ten years, or so, that fundamental environmental science has been recognized as a basic field in its own right. It is now clear that the protection of our environment and the maintenance of the biosphere depends on the progress that will be made in this field just as, by analogy, medical advances depend on research in biochemistry, biophysics, and molecular biology.

Fundamental environmental science is multidisciplinary and must, therefore, incorporate both practice and theory drawn from all the natural sciences: biology, chemistry, physics, geology, and mathematics. Consequently, subjects and aspects that are not of a purely chemical nature will show up in this series, even though it is prepared and published under the auspices of IUPAC. It should, however, be emphasized that chemistry has a key role in environmental science since it deals with the basic molecular reactions which underlie both biological and geological environmental processes occurring at the microscopic and, even, regional scale. This will only be possible through the development of new experimental methods and conceptual approaches which should:

1. avoid sample perturbation by performing the analysis *in situ*;
2. develop remote-controlled continuous monitoring systems in order to study both spatial and time dependencies;
3. measure not only concentrations of individual species but also thermodynamic and kinetic physico-chemical parameters (equilibrium and rate constants, diffusion coefficients, etc.);
4. interpret all of this data by considering the complexity and heterogeneous nature of the studied system.

These considerations fully justify starting this new series on environmental analytical chemistry. The reader should, however, be aware that in order to attain the previously mentioned goals 1 to 4, environmental analytical chemistry must no longer be considered as a field limited to the mere determination of contaminant concentration. Analytical chemists are trained to use the concepts of physical chemistry to study real samples, by taking into account all of their complexities. A major goal of analytical chemistry, therefore, should be to exploit this potential to contribute to the development of environmental and biological sciences. Environmental analytical chemistry, in particular, should play an important role in the development of rigorous approaches and new concepts to investigate physico-chemical processes occurring in real environmental systems.

[a]Dr Jacques Buffle: Department of Inorganic, Analytical, and Applied Chemistry, University of Geneva, Geneva, Switzerland.
[b]Dr Herman P. van Leeuwen: Laboratory for Physical and Colloid Chemistry, Agricultural University, Wageningen, the Netherlands.

Environmental analytical chemistry must no longer be considered as a field limited to the mere determination of contaminant concentration.

Volume 1

This book reports critical reviews on sampling, characterization, and the role and behaviour of particles in the environmental compartments: air, surface and ground waters, and sediment and soils. There is, presently, no clear definition of the word *particle* within the literature devoted to environmental science. It is often with different meanings depending on the context and scientific discipline involved. For instance, biologists refer to bacteria or even phytoplankton as biogenic particles whereas, for chemists, the term particle is generally associated to non-living entities. Most geologists and sedimentologists restrict the notion of *particles* to entities larger than 0.45 μm, whereas they may be much smaller for chemists and, even, subatomic for physicists. The situation is further confused since physical chemists and water treatment engineers often use the word colloid for nonliving entities smaller than 0.45 μm. Finally, chemists often use the term macro-molecule for certain small colloids or particles (<0.1 μm). All of these examples clearly show that there is an obvious basic language difficulty for such a book which intends to present a multidisciplinary approach of *particle* characteristics.

The term *environmental* particle (taken in its general sense) refers to particles of natural origin found in environmental compartments. In the air, the presence of particles is primarily due to erosion, marine aerosol formation, and combustion processes (either natural or anthropogenic). The description of the means allowing the determination of origin, nature, and fate of atmospheric particles is the subject of Chapter 1. In aquatic systems (oceans, lakes, rivers, ground water, and sediment pore water), particles (Fig. 1) are mainly produced by weathering processes (e.g. clays and metal oxides) and direct or indirect formation (e.g. calcium carbonate, silica, Fe and Mn oxyhydroxides, organic macromolecules, and cellular debris), due to life processes. In these systems, therefore, living organisms play an important role in controlling the concentration and nature of particles. It is believed that they even indirectly control the behaviour of non-biogenic particles like clays. For instance, organic macromolecules may adsorb on their surface and strongly influence their reactivity towards adsorbable toxic or vital compounds, as well as their coagulation and sedimentation.

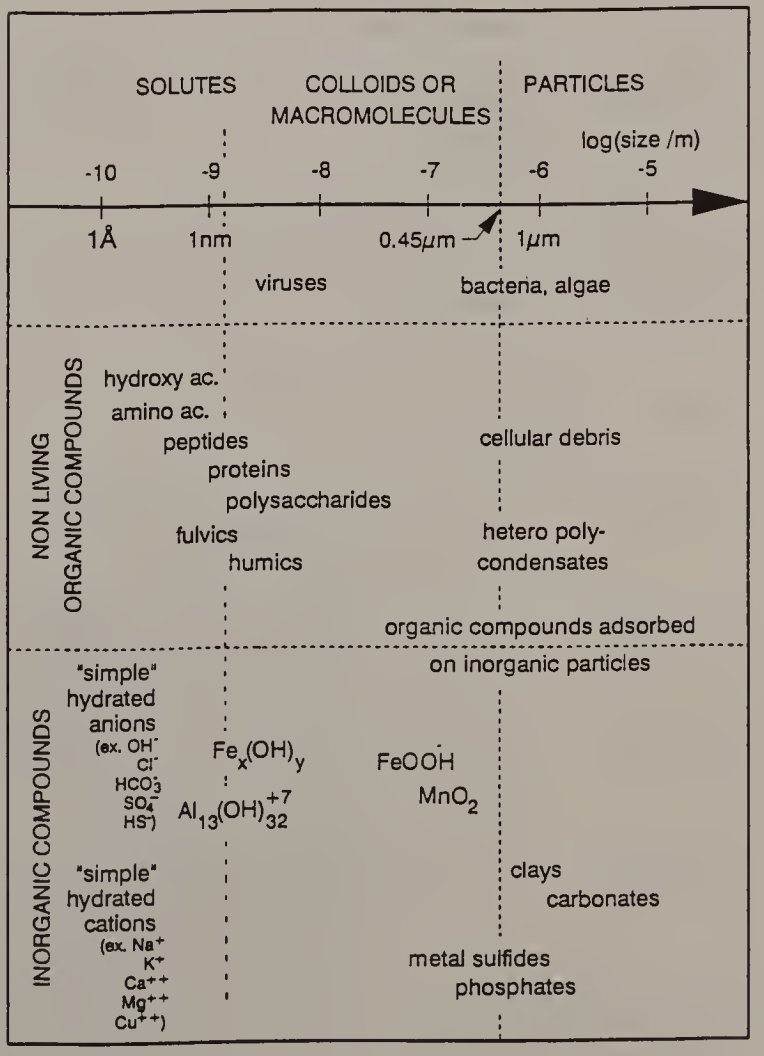


Figure 1. Nature and size domain of the most important particles of aquatic systems.

Environmental Particles, Volume 1

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Environmental Particles, *Volume 1 is edited by Jacques Buffle and Herman P. van Leeuwen and published by Lewis Publishers, Michigan, USA, 1992. xxii + 554pp. ISBN 0-87371-589-6. Price: USD 79.95.*

Little is known about the size distribution of environmental particles because of difficulties in sampling, sample handling, insufficient sensitivity and selectivity of analytical methods, and the lack of adequate theories which permit taking into rigorous account the physical and chemical heterogeneity of environmental samples. In all cases it must be realized that the size distributions of particles may be represented in different manners and give completely different pictures depending on whether particle mass, particle number, or particle surface area is considered as the dependent variable. In most aquatic systems the mass is dominated by particles larger than a few μm with smaller particles representing generally less than 10% (often <1%). If, however, the number of particles is considered for the same sample, particles smaller than 1 μm are the dominant class by several orders of magnitude. Consequently it is important to choose the most pertinent representation of the data, depending on what is the studied process. For instance, a size distribution based on particle mass is preferable for studying the fluxes of sedimenting particles (dominated by large particles), whereas coagulation processes (affecting mostly small particles) are better related to a size distribution based on particle number.

Similar considerations apply to the study of chemical reactivity of particles. In this case there is an additional difficulty since particles may react through the reactive groups located either on the external surface of the particle, for instance, with a crystallized iron oxide, or inside the particle itself, in the case of amorphous porous material, e.g. Fe oxyhydroxide, or of organic macromolecules, e.g. proteins and humic compounds. Depending on the degree of crystallinity of the particle, the surface area or the volume of the particles should be the dependent variable of interest for the size distribution, which may result in contradictory conclusions about the relative role of large and small particles. To make the choice a bit more difficult, large size particles more than small ones are often crystallized, which implies that the two size distributions should be considered simultaneously when studying the reactivity of particles. All these factors underline the urgent need of methods for specific chemical and physical characterization of environmental particles. Some of the analytical problems involved are discussed in Chapters 3, 4, 6, 7, 9 and 13. Development of such analytical methods cannot be done without simultaneously studying the properties of particles. The latter are discussed in Chapters 2, 4, 9, 11 and 12.

When compared to a homogeneous solution where classical chemical reactions occur, the peculiar role of environmental particles results from the fact that not only do they react chemically with toxic and vital compounds, but they also have important biophysico-chemical properties which strongly influence their circulation inside an environmental compartment and their transfer from one compartment to another. These processes influence:

- their formation (weathering, nucleation, or biogeneration);
- their transportation (free and turbulent diffusion, coagulation, sedimentation, or water flow);
- their elimination (biological degradation, sedimentation, or geochemical transformation).

As an example, there is a general decrease in particle concentration when passing from surface freshwaters to open oceans. This is mostly due to an increase in salinity which favours coagulation of small nonsettling particles to larger ones which are readily removed by sedimentation. The role of this particular process on the circulation of trace elements is discussed in Chapter 10.

Since vital and toxic compounds are, in most cases, associated with particles (from nm to hundreds of mm), the circulation and the role of these compounds in the environment cannot only be understood on the basis of their total concentrations or their own chemical properties. In addition to these data, all the processes mentioned in points 1 to 3 should be studies in detail and the corresponding, well-defined, physico-chemical parameters should be determined. Finally, these processes should be linked, using mathematical models, to the chemical properties of the toxic or vital compound of interest. Little is known in this field and a huge task remains to be done. This is particularly so if one considers that:

1. Environmental particle systems are chemically and physically very heterogeneous and their properties cannot be rigorously represented by physico-chemical parameters with a single, well-defined value. Most of these chemical and physical properties must be represented by distribution functions (e.g. for size or complexation or acid–base properties). These functions must be combined together in the previously mentioned models which implies important conceptual and mathematical developments.

2. Environmental systems are generally not in equilibrium, but either in some steady-state or subject to change in time (particle formation, coagulation, sedimentation, etc.). The dynamic factors affecting the existence and properties of the particles must, therefore, be studied both to understand the behaviour of environmental systems and to allow correct interpretation of analytical signals. As mentioned in 1, for certain kinetic properties, the ultimate task will be to measure the distribution functions of the corresponding parameters, rather than a single value valid for a particular occasional situation.

Most of the work in this field remains to be done. This book only intends to contribute to it by reviewing part of our present and limited knowledge and suggesting new and important topics in this field.

Future activities

The IUPAC Limited Lifetime Commission on Environmental Analytical Chemistry has endorsed the launch of a second programme on environmental particles, with contributions from international top-level specialists.

One category of subjects deals with environmental particle characterization techniques such as field-flow fractionation, size distribution measurements by photon correlation, spectroscopy, NMR and EXAFS for surface analysis. Other chapters highlight certain types of particles, for example manganese particles in freshwaters, carbonaceous particles in freshwaters, carbonaceous particles in the atmosphere.

Particulate formation and aggregation processes are also analysed and the role of particles in the transport of contaminants is explained. Draft reports of the various projects were discussed at a special programme meeting on 11–13 October 1991 in Davos, Switzerland and revised accordingly.

The Commission also decided to start with the preparation of a new main programme under the collective title 'Bio-active chemical species.' This programme commenced in the autumn of 1991 with support from the International Council of Scientific Unions (ICSU). It treats the nature of chemical species which are available for (or released by) organisms and which may have an important ecological significance. The analytical methods used and the environmental mechanisms controlling bioavailability will also be covered.

The Commission is also planning to initiate programmes on environmental interphases (structure, analysis and fluxes), and on environmental monitoring. In order to organize the extensive work in an efficient way, a Subcommittee on Environmental Interphases has been created.

Environmental Particles, **Volume 2 will include chapters on manganese particles and carbonaceous particles in freshwaters.**

Perspectives in Catalysis

IUPAC monographs in the series 'Chemistry of the 21st Century' consist of review papers written by scientists of world renown from various countries. The monographs aim to demonstrate the diversity of modern chemistry and show how innovations in chemistry and chemical technology can be expected to benefit human life in the next century. *Perspectives in Catalysis*, edited by John M. Thomas (CHEMRAWN Committee) and Kirill I. Zamaraev (Bureau member) is the first monograph in this series. The following outline is based on the preface to the book.

Introduction

With the monograph *Perspectives in Catalysis* IUPAC starts* officially a series of books under the heading 'Chemistry for the 21st Century'.

Reliable historical reports tell of the catalytic production of ether by the Alchemists of the Arab world when they added sulphuric acid to ethyl alcohol. But this is by no means the earliest practical use of catalysis. The phenomenon was certainly known to Aristotle; and early man had harnessed the power of catalysis - but without recognising its nature – in his primitive art and science. Notwithstanding its ancient lineage, it is perfectly proper that one of the first books of the series 'Chemistry for the 21st Century' should be dedicated to catalysis. Indeed, nowadays catalysis is considered world-wide as one of the top research frontiers in chemistry. It is the backbone of the chemical industry and hence the key to the production of fabrics, foodstuffs, fuels and pharmaceuticals. It is also a fundamental feature of all life processes.

In the past three decades we have witnessed in the scientific study of catalysis a progressive shift from phenomenological approaches to structural and mechanistic investigations at the molecular level, using new sophisticated and very powerful instrumentation, quantum chemical calculations and other computational methods. Engineering of catalytic reactors has also become more based on a deeper understanding of elementary steps, on insights into the kinetics and mechanisms of catalytic reactions and on mathematical modelling of catalytic processes and reactors. These mathematical models are being continually improved by taking account of the more sophisticated details of the interaction between reaction kinetics and mechanisms on the one hand, and a fuller recognition of mass- and heat-transfer phenomena in catalyst pores, pellets and beds, on the other hand.

Catalysis is considered world-wide as one of the top research frontiers in chemistry.

The use of catalytic technologies to purify exhaust gases and waste water is increasing.

Molecular design is already playing an important role in the development of new industrial catalysts and catalytic processes. We may expect that in the coming years, with the accumulation of data on structure of catalysts and mechanisms of their mode of action on the molecular level, its role will further increase.

On the eve of the 21st century new ideas emerging from basic research in catalysis promise breakthroughs that may change the very profile of the industries of the future. This is particularly true of the chemical and petroleum industry, where technologies based on catalysis already play a dominant role.

We also expect that the technology of catalysis will become progressively more important in other industries, where today they are not so widely used. An obvious example is provided by catalytic technologies that permit the purification of exhaust gases of various industries and autotransport. One may expect that in the 21st century energy production, various kinds of transport, the chemical and petroleum industry, metallurgy and other industries using chemical

*The prototype of a book from this series was published by Blackwell Scientific Publications in association with IUPAC in 1988: this was the monograph *Chemistry of Oxide Superconductors* (ed. C. N. R. Rao).

Editors: (left) John M. Thomas (The Royal Institution of Great Britain, London, UK) is a member of the CHEMRAWN Committee and was its Chairman until last year. Kirill I. Zamaraev (Institute of Catalysis of Russian Academy of Sciences, Novosibirsk, Russia) is a member of Bureau and the Executive Committee. He is a Past President of the Physical Chemistry Division.

treatment will become universally much safer and ecologically purer with the increasing use of catalytic technologies that can purify exhaust gases and waste water. These technologies will also exert a dominating role in energy production (catalytic combustion, catalytic fuel cells, catalytic conversion of solar energy, etc.) in metallurgy, biotechnology and in medicine. Envisaged innovations in catalysis science and engineering are expected to make the industry of the 21st century much more efficient, safer and to engender improvements in the quality of our lives.

State of art and perspectives

In the 18 chapters of this monograph, the state of art and perspectives in various fields of catalysis science and engineering – although not all fields, since it is hardly possible to cover all the numerous facets of catalysis in one book – are discussed.

The first two chapters, 'Creating the future of the chemical industry – catalysts by molecular design' by J. A. Cusumano and 'Perspectives in catalysis: via studies on molecular level to new industrial catalysts and processes' by K. I. Zamaraev, present an overview of the state and perspectives of basic research in catalysis, as well as of the breakthroughs that new catalytic technologies are expected to provide in various industries.

Chapter 3, 'Design of catalysts based on metal complexes' by V. A. Likholobov, demonstrates how the knowledge accumulated in the area of coordination and organometallic chemistry, homogeneous catalysis, surface physical, quantum and computer chemistry can be used for prognosis of the catalytic properties of metal complexes and design of new homogeneous and heterogeneous catalysts based on such complexes.

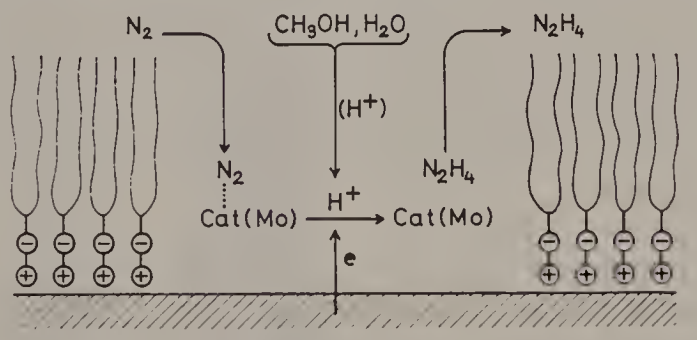
Chapter 4, 'Catalysis with giant palladium clusters' by I. I. Moiseev and M. N. Vargaftik, presents the catalytic chemistry of a new recently discovered family of soluble cluster catalysts, that contain several hundred metal atoms and demonstrate unique catalytic properties. With respect to their structure and properties, such giant metal clusters are situated on the border between traditional homogeneous metal complex catalysts and heterogeneous metal catalysts. These clusters are expected to inherit the positive features of both the classes of catalysts, i.e. the high activity characteristic of good metal catalysts, and the high selectivity characteristic of good metal complex catalysts.

The fifth Chapter, 'Surface organometallic chemistry on oxides, on zeolites and on metals' by J. M. Basset, J. P. Candy, A. Choplin, B. Didillon, F. Quignard and A. Theolier, presents an overview of the field of organometallic surface chemistry that is of vital importance for heterogeneous catalysis. The authors demonstrate how the rules of molecular organometallic chemistry can be applied to organometallic species on solid surfaces. They also show how the approaches of organometallic chemistry can be used to design and prepare well-defined catalytically active sites on the surface of oxides, zeolites and metals.

Chapter 6, 'Correlations and differences between homogeneous and heterogeneous catalysis – a surface science view' by G. A. Somorjai, presents an overview of the most important results obtained within the last two decades in the studies of heterogeneous catalysis on well-characterized surfaces of single crystals with modern instrumentation, as well as the impact from these studies on applied catalysis.

In Chapter 7, 'Catalysis with organized molecular systems' by A. E. Shilov, sophisticated multicomponent catalytic systems with a special space arrangement, energy and orbital correspondence of their molecular constituents, are discussed. Such systems are designed along with the principles of enzymatic (i.e. biological) catalysis and aimed at accomplishing rather difficult and complicated catalytic reactions in mild conditions via the optimal pathways which provide simultaneously high activity and selectivity, as well as minimal waste of energy.

Catalysis with organized molecular systems



Chapter 7 of Perspectives in Catalysis is a paper by Alexander E. Shilov (Institute of Chemical Physics, Chernogolovka, Moscow Region, Russia) entitled 'Catalysis with organized molecular systems.' The paper includes a discussion of the catalytic reduction of dinitrogen (see above figure). The catalyst is a molybdenum(III) complex. This is incorporated in a phospholipid film covering the surface of a sodium amalgam. The amalgam acts as a reducing agent. Electrons move from the electron donating surface to the attached catalyst. Molecules of a proton donating solvent (methanol or water) diffuse through the hydrophobic film to the catalyst. Thus the formation of H_2, which is also catalysed by molybdenum complexes and proceeds in parallel with dinitrogen reduction, is slowed down.

In Chapters 8 and 9, 'Kinetics in catalysis' by M. Boudart and 'Kinetic models in heterogeneous catalysis' by G. S. Yablonskii and V. I. Elokhin, the principal concepts of chemical kinetics, as referred to heterogeneous catalysis, are outlines, and the role of kinetic studies is discussed in elucidation of the mechanisms of catalytic reactions, in the design of new catalysts, as well as in the optimization of catalytic reactors and processes.

Chapters 10 and 11, 'Modelling of heterogeneous catalytic reactions and reactors' by W. J. Thomas, and 'New trends in the analysis and design of catalytic reactors' by L. K. Doraiswamy, B. D. Kulkarni and S. Ravi Kumar, present an overview of the methods of mathematical modelling which are widely used in design and optimization of heterogeneous catalytic reactions and reactors. In his Chapter, W. J. Thomas outlines general concepts of mathematical modelling, and typical models for the analysis of the performance of various types of catalyst beds and catalytic reactors are presented. In the Chapter by L. K. Doraiswamy, B. D. Kulkarni and S. Ravi Kumar some new trends in the analysis and design of catalytic reactors are discussed and examples are given of how the use of mathematical models that reflect rather intimate details of molecular ordering and dynamics on solid surfaces, can suggest the ways for further optimization of the performance of catalytic reactions in industry.

Today, the catalytic technologies for the production of various organic compounds are based mainly on the use of oil as a feedstock. However, in the next century the feedstocks for organic compounds may become much more diverse, in particular, natural gas and coal may become widely used. Therefore, catalytic chemistry of natural gas and coal may perhaps become much more important than they are today. Of special interest here is the catalytic chemistry of methane (i.e. the main and rather chemically inert component of the natural gas), which is nowadays being created. Chapter 12, 'Catalytic chemistry of methane conversion' by M. Baerns and J. R. H. Ross, gives an overview of the state and perspectives of this exciting and rapidly developing new area of catalysis.

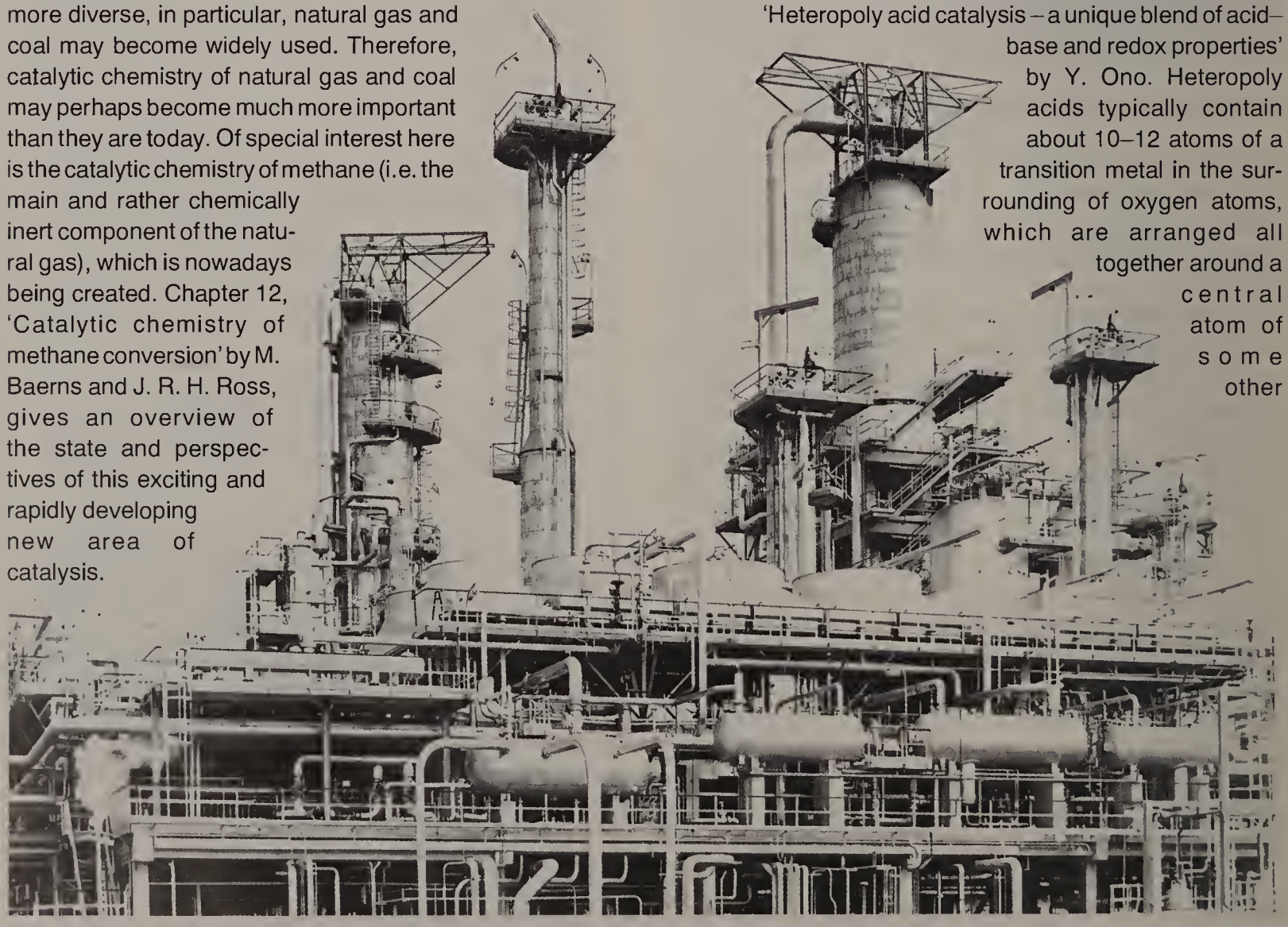
Chapter 13, 'Catalysis for energy production' by V. N. Parmon, S. R. Ismagilov and M. A. Kerzhentsev, presents an overview of modern trends in application of catalysis to the energy industry. The catalytic processes that can provide conversion of one form of energy to another are outlined. Both a more traditional field of catalysis application to obtain heat via controlled combustion of various fuels, and non-traditional fields dealing with the use of catalysis in nuclear, solar and electrochemical energetics are discussed.

In Chapter 14, 'The application of catalyst technology to pollution control' by G. J. K. Acres, the present state and perspectives of catalytic technologies for preventing pollution are discussed.

J. Haber, in his assessment (Chapter 15) of the 'Architecture of oxide catalysts', summarizes present knowledge of the simple structure and dynamics of a variety of solid oxides used extensively in catalysis.

In Chapter 16, 'New insights into zeolite catalysis' by C. S. John, D. M. Clark and I. E. Maxwell, an overview is given of new applications of zeolites and $AlPO_4$-based molecular sieves in the gas and oil industry, and for the production (present and potential) of petrochemicals and petroleum-based fine chemicals. In particular, the potential of zeolites and other molecular sieves to increase the selectiveness of various chemical transformations and overcome many of the environmental and safety problems, are emphasized.

Another class of catalysts that can be placed on the border between homogeneous and heterogeneous catalysts are heteropoly acids, which are discussed in Chapter 17, 'Heteropoly acid catalysis – a unique blend of acid–base and redox properties' by Y. Ono. Heteropoly acids typically contain about 10–12 atoms of a transition metal in the surrounding of oxygen atoms, which are arranged all together around a central atom of some other



Basic research in catalysis will lead to profound breakthroughs and changes in the profile of industries in the future. (*Photo: Hoechst AG/Walter Kloos.*)

Catalytic cracking unit: current catalytic technologies for production of organic compounds are based mainly on the use of oil as a feedstock. (*Shell photo*.)

element, such a phosphorus, or silicon. Heteropoly acids indeed demonstrate a unique blend of catalytic properties, being simultaneously very efficient in both acid-base and redox reactions. In particular, similar to redox enzymes, they are capable of catalysing multielectron redox reactions. Moreover, their redox potential can be varied over a wide range in controlled fashion by simple changes of their chemical composition. They are also very strong acids, able to operate both as homogeneous catalysts in solution and as solid heterogeneous catalysts.

The last Chapter, 'Catalysis with clays and their pillared variants' by J. M. Thomas and C. R. Theocharis, presents an overview of the state of art and potential in this promising area of catalysis, which nowadays is experiencing a renaissance inspired in part by the methods of molecular design that have emerged from basic research. Clays are, like zeolites and the heteropoly acids, particularly useful as solid acid catalysts, materials likely to be of great importance in the 21st century.

From the data presented in various Chapters of this monograph one many indeed expect that new ideas emerging from basic research in catalysis will, on the eve of the 21st century, lead to profound breakthroughs and changes in the profile of industries of the future.

Perspectives in Catalysis *is edited by John M. Thomas and Kirill I. Zamaraev and published by Blackwell Scientific Publications, Oxford, UK, 1992, xv + 492 pp. ISBN 0-632-03165-4. Price: GBP 69.50/USD 110.00. Affiliate Members discount price GBP 41.70/USD 66.00.*

Publications

New IUPAC Handbook

The *IUPAC Handbook 1991–1993* was published in June this year. This latest handbook is intended to provide, in one volume, up-to-date and detailed information on the membership, working programmes, and rules of operation of IUPAC. It will be a useful reference source for chemists and chemical organizations world-wide.

The volumes includes details of the following: Organization of IUPAC 1991–93; IUPAC officers, past officers and Secretariat; IUPAC general assemblies and congresses; Membership lists of IUPAC bodies 1991–93; National adhering organizations; Observer countries; Associated organizations; Company associates; IUPAC bodies: Bureau, Executive Committee, standing committees; divisions/section and their commissions, subcommittees and working parties; Standing orders from Executive Committee; Alphabetical index to members of IUPAC bodies 1991–93; Current programmes 1992; Guidelines for IUPAC programmes; Reports published 1990 and 1991; Guidelines for applying for sponsorship of symposia; List of symposia sponsored by IUPAC (at 92.03.31); Procedure for comment and approval of IUPAC recommendations on nomenclature and symbols; Guidelines for drafting IUPAC recommendations (1992); Statutes and Bylaws; Appointment and functioning of national representatives on IUPAC bodies; Rules of divisions; Terms of reference for divisions/section and commissions; Affiliate membership programme.

IUPAC Handbook 1991–1993, *was published by Blackwell Scientific Publications, Oxford, 1992, xi + 256 pp. ISBN 0632 03498 X. Price GBP 27.50/USD 35.00; Members discount price GBP 13.50/USD 17.50. The handbook may be ordered from Blackwell Scientific Publications Ltd, Osney Mead, Oxford OX2 0EL, UK. Tel: +44 (865) 240 201.*

Oils, fats and derivatives

Standard Methods for the Analysis of Oils, Fats and Derivatives: 1st Supplement to the 7th Revised and Enlarged Edition was published by Blackwell Scientific Publications in May this year. The supplement was prepared for publication by A. Dieffenbacher (Nestle Research Centre, Lausanne, Switzerland) and W. D. Pocklington (Laboratory of the Government Chemist, Teddington, UK) who are respectively Chairman and Past-Chairman of the IUPAC Commission on Oils, Fats and Derivatives (VI.3).

Since the publication of the 7th edition of the Standard Methods, the Commission has developed and adopted more than 20 new methods. Of the methods published in the 1st Supplement, 15 have already been published in *PAC*. New sections containing methods for lecithins and emulsifiers are now included in the supplement.

Of the methods for lecithins, four (phospholipids by thin-layer chromatography and phosphorus content, phospholipid profile by high-performance liquid chromatography, acetone-insoluble matter, and toluene-insoluble matter) have been specially developed by Commission VI.3, the remainder being general methods for oils and fats (published in the 7th edition). The precision of four of the five general methods included has been evaluated by collaborative study and shown to be satisfactory for the analysis of lecithins.

The provision of a new binder with this 1st Supplement to the 7th edition will allow the new material to be added to the original material, and retained in one binder. In some cases, it may not be possible to insert the new material at exactly the right point due to the original pagination sequence. Subscribers are therefore permitted to photocopy the original pages where necessary so that new methods can be inserted in the correct position.

An important development since the appearance of the 7th edition has been the publication (1990) of the *IUPAC Harmonized Protocol for the Presentation of the Performance Characeristics of Standardized Analytical Methods*. Unfortunately the time available for preparing the methods in the 1st Supplement for publication has not allowed the presentation of the performance characteristics of the majority of these methods in the recommended IUPAC protocol. However, it is hoped that a future 8th edition will see all the methods presented according to the recommended protocol.

Included in the 1st Supplement are the general principles of analytical quality control which have been reproduced from *Pure Appl. Chem.* **62** (1), 153–154 (1990). A limited number of new methods in this 1st Supplement have associated with them specific applications of analytical quality control, presented according to the IUPAC protocol.

Standard Methods for the Analysis of Oils, Fats and Derivatives: 1st Supplement to the 7th Edition *prepared for publication by A. Dieffenbacher and W. D. Pocklington is published by Blackwell Scientific Publications, Oxford, UK, 1992. xix + 160 pp, 10 illustrations. ISBN 0-632-03337-1. Price (with Ring Binding) GBP27.50/USD 39.50. Affiliate Members discount price GBP 16.50/USD 23.70.*

Analysis of pesticides and related devices

AOAC International (formerly the Association of Official Analytical Chemists) has released the 2nd edition of the Environmental Protection Agency (EPA) *Manual of Chemical Methods for Pesticides and Devices*, a compendium of 284 chemical methods for the analysis of 190 chemicals commonly used in commercial pesticide formulations and technical materials. Featuring 18 new methods and eliminating outdated and redundant methods and methods for which an equivalent procedure exists in *Official Methods of Analysis of the AOAC*, it will be useful to those working in analysis of pesticides for research, quality control, or regulatory compliance.

Although procedures in this manual have not achieved official AOAC International status thorough collaborative testing, most have been validated in either EPA or state laboratories and are believed to be the most suitable and, in some cases, the only methods available for a particular formulation.

A typical entry contains: the names by which the chemical is known, its chemical formula, its physical properties, reagents, equipment, and procedure to be used for its determination, as well as other details such as formulas for calculating percent of chemical present in sample analysed.

Other features include a cross referenced index containing chemical, common, and trade names, a pesticide formulations bibliography, and a conversion table listing 1st Edition and 2nd Edition method numbers.

AOAC International is a scientific organization whose primary objective is to promote methods validation and quality measurements in the analytical sciences.

The purchase price of Manual of Chemical Methods for Pesticides and Devices *(2nd Edition) is USD 131.00 in North America (Canada, Mexico and USA) and USD 154.00 outside North America with a 10% discount for AOAC International members. For more information or to order call AOAC International at +1 (703) 522-3032 or fax +1 (703) 522-5468.*

Emergency response centres

The *International Directory of Emergency Response Centres* is the result of a cooperative project by the Organisation for Economic Cooperation and Development (OECD) and the United Nations Environment Programme (UNEP).

The directory has been prepared in response to worldwide demand for easily accessible information about sources of help in case of emergencies involving hazardous substances. It contains details of 36 Emergency Response Centres in 29 countries all over the world. The centres have been chosen to meet the following criteria:

- they are accessible to callers worldwide, 24 hours a day;
- they respond in the case of accidents involving non-radioactive hazardous substances (some may also respond in case of accidents involving radioactive substances and/or to natural disasters);
- they maintain lists of experts and other information which they will share internationally;
- they serve as coordination points for emergency response operation in their countries.

The main purpose of the directory is to help emergency responders in finding immediate advice from foreign experts when an accident involving hazardous substances occurs. By contacting the centres in the directory, technical advice may also be obtained in order to help prevent technological accidents and plan and prepare emergency response. It is intended that the directory will be regularly updated and expanded.

The International Directory of Emergency Response Centres *is being issued free of charge. Copies can be obtained from EITHER (1): OECD Chemicals Division, 2, rue André-Pascal, 75775 Paris Cedex 16, France. Fax: +33 (1) 4524 1675. OR (2): UNEP Industry and Environment Programme Activity Centre, Tour Mirabeau, 39–43 Quai André Citroen, 75739 Paris Cedex 15, France. Fax: +33 (1) 4058 8874.*

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

February 1992 issue of *ISO Bulletin*

TC 21	**Equipment for fire protection and fire fighting**
ISO 7201-2:1991	Fire extinguishing media – Halogenated hydrocarbons – Part 2: Code of practice for safe handling and transfer procedures of halon 1211 and halon 1301
TC 27	**Solid mineral fuels**
ISO 9931:1991	Coal – Sampling of pulverized coal conveyed by gases in direct fired coal systems
TC 34	**Agricultural food products**
ISO 5530-4:1991	Wheat flour – Physical characteristics of doughs – Part 4: Determination of rheological properties using an alveograph
ISO 6799:1991	Animal and vegetable fats and oils – Determination of composition of the sterol fraction – Method using gas chromatography
TC 35	**Paints and varnishes**
ISO 1512:1991	Paints and varnishes – Sampling of products in liquid or paste form
ISO 2808:1991	Paints and varnishes – Determination of film thickness
TC 38	**Textiles**
ISO 9865:1991	Textiles – Determination of water repellency of fabrics by the Bundesmann rain-shower test
TC 45	**Rubber and rubber products**
ISO 4656-2:1991	Rubber compounding ingredients – Carbon black – Determination of dibutyl phthalate absorption number – Part 2: Method using plastograph or plasticorder
ISO 8033:1991	Rubber and plastics hose – Determination of adhesion between components
TC 54	**Essential oils**
ISO 3526:1991	Oil of sage (*Salvia lavandulifolia*)
ISO 9910:1991	Oil of sweet orange – Determination of the total carotenoids content
TC 107	**Metallic and other inorganic coatings**
ISO 4532:1991	Vitreous and porcelain enamels – Determination of envelope-specific surface area from measurements of the permeability to air of a powder bed under steady-state flow conditions
ISO 10076:1991	Metallic powders – Determination of particle size distribution by gravitational sedimentation in a liquid and attenuation measurement
TC 126	**Tobacco and tobacco products**
ISO 4388:1991	Cigarettes – Determination of the smoke condensate retention index of a filter – Direct spectrometric method
TC 129	**Aluminium ores**
ISO 10213:1991	Aluminium ores – Determination of total iron content – Titanium trichloride reduction method
TC 175	**Fluorspar**
ISO 9503:1991	Metallurgical-grade fluorspar – Determination of available fluorine content – Modified Willard-Winter method

March 1992 issue of *ISO Bulletin*

TC 17	**Steel**
ISO 10697-1:1992	Steel – Determination of calcium content by flame atomic absorption spectrometry – Part 1: Determination of acid-soluble calcium content
TC 34	**Agricultural food products**
ISO 1108:1992	Spices and condiments – Determination of non-volatile ether extract
ISO 9874:1992	Milk – Determination of total phosphorus content – Method using molecular absorption spectrometry
ISO 10095:1992	Coffee – Determination of caffeine content – Method using high-performance liquid chromatography
TC 45	**Rubber and rubber products**
ISO 4643:1992	Moulded plastics footwear – Lined or unlined poly(vinyl chloride) boots for general industrial use - Specification
ISO 5423:1992	Moulded plastics footwear – Lined or unlined polyurethane boots for general use – Specification
ISO 6110:1992	Moulded plastics footwear – Lined or unlined poly(vinyl chloride) industrial boots with chemical resistance – Specification
ISO 6112:1992	Moulded plastics footwear – Lined or unlined poly(vinyl chloride) industrial boots with general-purpose resistance to animal fats and vegetable oils - Specification
ISO 6910:1992	Moulded plastics footwear – Lined or unlined polyurethane industrial boots with general-purpose resistance to animal fats and vegetable oils – Specification
TC 54	**Essential oils**
ISO 4728:1992	Oil of wild thyme (*Thymus mastichina*, L.)
TC 61	**Plastics**
ISO 800:1992	Plastics – Phenolic moulding materials – Specification
TC 85	**Nuclear energy**
ISO 9271:1992	Decontamination of radioactively contaminated surfaces – Testing of decontamination agents for textiles
ISO 9978:1992	Radiation protection – Sealed radioactive sources – Leakage test methods
TC 147	**Water quality**
ISO 8165-1:1992	Water quality – Determination of selected monovalent phenols – Part 1: Gas chromatographic method after enrichment by extraction
TC 156	**Corrosion of metals and alloys**
ISO 8565:1992	Metals and alloys – Atmospheric corrosion testing – General requirements for field tests
ISO 9591:1992	Corrosion of aluminium alloys – Determination of resistance to stress corrosion cracking
TC 175	**Fluorspar**
ISO 9505:1992	All grades of fluorspar – Determination of arsenic content – Silver diethyldithiocarbamate spectrometric method

April 1992 issue of *ISO Bulletin*

TC 45	**Rubber and Rubber products**
ISO 124:1992	Rubber latices – Determination of total solids content
ISO 498:1992	Natural rubber latex concentrate – Preparation of dry films
ISO 1126:1992	Rubber compounding ingredients – Carbon black – Determination of loss on heating
ISO 1802:1992	Natural rubber latex concentrate – Determination of boric acid content
ISO 3257:1992	Rubber compounding ingredients – Carbon black – Method of evaluation in styrene-butadiene rubbers
TC 61 Plastics	
ISO 1874-1:1992	Plastics – Polyamide (PA) homopolymers and copolymers for moulding and extrusion – Part 1: Designation
TC 85	**Nuclear energy**
ISO 9278:1992	Uranium dioxide pellets – Determination of density and amount of open and closed porosity – Boiling water method and penetration immersion method
ISO 9279:1992	Uranium dioxide pellets – Determination of density and total porosity – Mercury displacement method
ISO 10645:1992	Nuclear energy – Light water reactors – Calculation of the decay heat power in nuclear fuels
TC 126	**Tobacco and tobacco products**
ISO 3308:1991	Routine analytical cigarette-smoking machine – Definitions and standard conditions
ISO 4387:1991	Cigarettes – Determination of total and nicotine-free dry particulate matter using a routine analytical smoking machine
ISO 8243:1991	Cigarettes – Sampling
ISO 8452:1992	Raw tobacco – Determination of chlorophyll residues content (green index)
TC 156	**Corrosion of metals and alloys**
ISO 9223:1992	Corrosion of metals and alloys – Corrosivity of atmospheres – Classification
ISO 9224:1992	Corrosion of metals and alloys – Corrosivity of atmospheres – Guiding values for the corrosivity categories
ISO 9225:1992	Corrosion of metals and alloys – Corrosivity of atmospheres – Measurement of pollution
ISO 9226:1992	Corrosion of metals and alloys – Corrosivity of atmospheres – Determination of corrosion rate of standard specimens for the evaluation of corrosivity

IUPAC Accounts for 1991

The audited IUPAC accounts and auditors' report for 1991 are preceded by the comments of IUPAC Treasurer Prof. John Ward.

Treasurer's comments

The Treasurer, Prof. John Ward: 'We need to determine priorities and take the inevitable painful decisions.'

It is inevitable that correctly presented accounts contain a profusion of numbers but the one that really matters is that which appears at the bottom left. That figure for 1991 is large and negative; in fact, a deficit of USD 161 602. It is, though, not at all unexpected.

Both my predecessor, Prof. Anders Björkman, and the Finance Committee repeatedly warned that the Union should not expect income from its publications and income from its investments to continue to rise as they had from 1981 to 1986. If income were to keep pace with the increasing rate of annual expenditure it was necessary to increase subscriptions in line with inflation. That warning was not heeded and, as I pointed out in last year's Finance Committee report [*Chem. Intl.* **13**, 173–175 (1991)], subscription income fell from about 80% of total income in 1984 to about 55% in 1990. Furthermore, forecasts by two independent methods warned that if recent trends in income and expenditure continued, the Union would run-up a cumulative deficit of about USD one million by 1995.

That report made to Council at the Hamburg General Assembly last year convinced them that urgent action was needed and they agreed that painful cuts in expenditure in the 1992–93 biennium were necessary and that subscriptions should be increased by 5% in each of the two years. This apart, the 1991 budget already assumed a deficit of USD 194 000 by the year end. In fact it would appear from the accounts that the actual deficit was less, at USD 161 602 but this conclusion needs to be hedged with reservations. The variation in dollar exchange rates has a significant, and sometimes decisive effect on our financial outcome. If the previously used accounting convention about the date for conversion between currencies is taken (the first day of the final accounting month), the deficit is USD 256 515, the figure reported to the Finance Committee at its annual meeting in February this year. However, our auditors subsequently recommended that we follow the convention which companies are forced by law to adopt in many countries, of making the conversion on the last day of the accounting year, in our case 31 December. That, and adopting another of their recommendations about the date of allocating investment dividends, gave rise, unusually, in 1991 to the large adjustment of USD 94 913 to give USD 161 602. It must be pointed out that in most years the effect of adopting the recommended convention would not have been so marked.

One could argue that the budget figure and the actual figure should be compared using the same conventions and so the actual exceeds the budget by USD 62 515, on the wrong side. But even here, the size of the difference is again almost all due to variations in the exchange rate because at the time we had to sell DEM to provide money for the Hamburg General Assembly, the exchange rate was very much against us; something we could not have foreseen. If we could foresee exchange rates even a day or two ahead we could make a fortune both for the Union and ourselves.

To answer the question that immediately arises, the Finance Committee regularly considers whether we should change our reference currency. The strong argument in favour of the US dollar continues to be the ease with which it can be exchanged all over the world, but it may be that this advantage will be outweighed in the future by the stability and growing use of the DEM or ECU.

The exchange rate is outside our control but when the items of income and expenditure within our control our compared, we find that the over and under estimates in the budget nearly balance. The largest "plus" item is a saving of about USD 100 000 on the Hamburg General Assembly. The principal "minus" items are lower contributions from publications (by USD 14 790) and from investments (by USD 19 765) together with additional expenditures of USD 26 227 for mission oriented programmes and USD 48 679 arising from a decision to anticipate an intention to speed up some of the operations at Oxford by extending the computer network.

The Union has a difficult task in adjusting the future balance between income and expenditure and it is fortunate that its reserves (assets), although slightly down on 1990, are strong enough to maintain the present level of investment income and strong enough to allow the time to get the balance adjusted. You will see from the Financial Summary, however, that the level of supplementary assets – the amount by which the reserves exceed the target level – is sharply down from USD 595 845 in 1990 to USD 72 085 in 1991; another indication that our expenditure is running ahead of our income.

The lessons to be learned from examining the accounts are the same as those I outlined as Chairman of the Finance Committee at Hamburg. We have to match the cost of our programmes to our annual income, which means determining priorities and taking the inevitable painful decisions. At the same time we have to find means to increase our income so that we can restore the proportion given to Divisions for the essential scientific work of the Union.

Even to stand still we must increase our subscriptions to match annual rates of inflation. If we are to strengthen our scientific programmes we need to increase them by more than inflation. A 10% annual increase is needed to have any marked effect. However, we should also try to increase the support we get from those who benefit from the Union's work. In particular, support from the chemical industries, although we all need to wait until the present difficult times are past.

Finally, it hardly needs to be said that we must continue to be efficient and economical in all we do.

Balance Sheet as at 31 December 1991 (expressed in USD)

Assets			**Liabilities**		
Fixed Assets[a]	48 679		*Capital Account*		2 335 692
Fixed Assets/Depreciation[b]	(9 736)	38 943	*Accounts Payable*[f]		29 967
			Paulo Franzosini Fund		5 659
Cash in Banks			*Provisions*		
USD	307 490		CTC-Teaching Environ. Chem. 970	1 200	
GBP	(40 749)		CTC-INCE	500	
CHF	566		Bad Debts	53 543	
DEM	78 130		CHEMRAWN Rolling Fund	(8 037)	
Money Market Investments	696 336		Neutra Examination	7 500	
Cash in East European Banks [c]	9 084	1 050 858	Solubility Data Series	1 649	
Marketable Securities at Cost		1 131 340	History of IUPAC	20 000	
Accounts Receivable[d]		18 482	Purchases from Blackwells/Pergamon	4 621	
Sundry Debtor		38 194	Roy. Soc. Contbn. to Dev. Activs.	16 526	
Subscriptions etc. Outstanding[e]			Kratos Grant[g]	586	
National Organizations	86 022		ICSU Grants 1991	17 738	
Observer Country Service Charges	50		Lewis Publishers	2 000	117 826
Company Associates Service Charges	1 575	87 647	*Prepaid Subscriptions*[h]		50
Excess of Expenditure over Income		161 602	*Sundry Creditor*		17 050
			Capital Gains Realized		20 822
		2 527 066			2 527 066

[a]Comprises 38 679 for establishment of a computer network at the Secretariat and 10 000 to complete the work in1992.

[b]Depreciation of Fixed Assets over 5 years.

[c]Cash in East European Banks

Bulgaria	44	
Czechoslovakia	3 853	
Hungary	415	
Poland	663	
USSR	4 109	9 084

Revalued at 91.12.31 using relevant exchange rates for national currency to USD

[d]Accounts Receivable

List Oxford		18 482

[e]See right-hand column.

[f]Accounts Payable

List Zürich	1 482	
List Oxford (including USD 10 000 provision for capital expenditure on computer network)	29 485	29 967

[g]Commission V.2

[h]Prepaid 1992 subscription

Observer Country – Mexico		50

[e]Subscriptions, etc. Outstanding

National Organizations (1989)		
Cuba	700	
National Organizations (1990)		
Brazil	2 000	
Chile	1 600	
Cuba	1 900	
Ethiopia	400	
Japan	1 975	
Peru	2 100	
Yugoslavia	3 550	13 525
National Organizations (1991)		
Argentina	2 100	
Belgium	11 300	
Brazil	8 900	
Bulgaria	5 100	
Chile	1 600	
China/Beijing	1 900	
Cuba	1 900	
Ethiopia	400	
India	11 300	
Ireland	3 300	
Japan	1 600	
Nigeria	2 400	
Peru	2 000	
Turkey	4 200	
UK	9 297	
Yugoslavia	4 500	71 797
Service Charges Company Associates (1991)		
UK	630	
USA	945	1 575
Service Charges Observer Countries (1990)		
Jamaica		50
		87 647

Statement of General Income and Expenditure for Year ended 31 December 1991 (expressed in USD)

Expenditure			Income		
Office Expenses			*National Subscriptions*		
IUPAC Officers	12 218		Received	438 074	
IUPAC Secretariat (non-pubns.)	284 116		Outstanding	71 797	509 871
Depreciation of Fixed Assets	9 736*				
Audit, Bank Fees, Other Charges	34 853	340 924	*Company Associates Service Charges*		
			Received	5 265	
Expenses IUPAC Bodies			Outstanding	1 575	6 840
Administration Expenses	39 022				
Meetings:			*Observer Countries Service Charges*		
Other than General Assembly	122 233		Received		500
General Assembly	517 976	679 231			
Symposia, Seminars, IVPs (a)		2 500	*Interest and Dividends Earned* (c)		184 301
Bad Debts Write Off		9 025	*Subvention/Grants from ICSU*		26 100
Provisions Made			*Transfer from Publication Subaccount*		88 210
Roy. Soc. Contbn. to Dev. Activs.	16 526				
Neutra Provisions	7 500		*Withdrawals from Provisions*		
Kratos Grant	586		Symposia, Seminars, IVPs	5 000	
ICSU Grants 1991	17 738		Committed Expenditure	136 422	
CTC-Teaching Environ. Chem.	1 200		Bad Debts	9 025	
CTC-INCE	500		IUPAC Handbook	16 050	
Lewis Publishers	2 000	46 050	Roy. Soc. Contbn. to Dev. Activs.	11 345	
			Toxicology Glossary	5 940	
Other Expenses			Kratos Grant	586	
ICSU Grants	8 362		Neutra Provision	5 000	
Toxicology Glossary	5 940		CTC	700	190 068
EERO Grant (b)	4 788				
Contributions to ICSU	14 564		*Other Income*		
Representatives Other Organizations	11 674		Pergamon Travel Grant	3 000	
IUPAC Handbook 1989–1991	15 625		EERO Grant & Lewis Publishers	6 788	
Roy. Soc. Contbn. to Dev. Activs.	3 500		CTC-INCE Contbn.	500	
Transfer to Publications Subaccount for *Chem. Intl.* for IUPAC Members	11 002		Roy. Soc. Contbn. to Dev. Activs.	8 682	18 970
Transfer to Affiliates in Developing Countries	24 482		Excess of Expenditure over Income		161 602
Miscellaneous Expenses	2 011	101 949			1 186 462
Foreign Exchange Differences		6 782			
		1 186 462			

*See note (h) to 1991 balance sheet.
[a]IVPs = IUPAC Visiting Professorships.
[b]EERO = European Environmental Research Organization.
[c]USD 481 interest on capital of Paulo Franzosini Fund already deducted.

Statement of Publication Income & Expenditure for Year ended 31 December 1991 (expressed in USD)

Expenditure			Income		
IUPAC Secretariat (publications)		194 247	*Publications*		
			Blackwell	286 335	
Blackwell Purchases/Chem. Intl. for IUPAC Members		11 002	Pergamon	15 166	
			Other Publishers	11 707	
Solubility Data Series			Secretariat	306	313 515
Expended	839				
Provision Made	1 649	2 488	*Support of Publication Activities by Blackwell*		13 500
Chemical Databases		23 609			
			Transfer for Blackwell Purchases/ Chem. Intl. *for IUPAC Members*		11 002
Miscellaneous Expenditure		20 949			
			Solubility Data Series		
Transfer to General Income & Expenditure Account		88 210	Last Year's Provision	988	
			Income	1 500	2 488
		340 506			340 506

Statement of Affiliate Membership Programme Income & Expenditure for Year ended 31 December 1991 (expressed in USD)

Expenditure		Income	
IUPAC Secretariat (AMP)	40 028	*Contributions*	
		In USD	66 492
Chem. Intl. *& Leaflets*	51 690	Cash in East European Banks	2 940
Miscellaneous Expenses	9 527	*Royalties Blackwells*	6 514
	101 245	*Income Ties & Scarves*	816
		Transfer from General Income & Expenditure Account for Affiliates in Developing Countries[a]	24 482
			101 245

[a]IUPAC subsidy for Affiliates in Developing Countries.

Statement of CHEMRAWN Income & Expenditure for Year ended 31 December 1991[a] (expressed in USD)

Expenditure		Income	
CHEMRAWN Committee Expenses	4 647	*Transfer from Provision for CHEMRAWN Rolling Fund*	–3 390
Transfer to CHEMRAWN Rolling Fund	–8 037		
	–3 390		–3 390

[a]CHEMRAWN = CHEMical Research Applied to World Needs.

Securities Account Statement as at 31 December 1991

	Currency	Amount	Approx. price (%)	Approx. value (USD)	Book value at cost (USD)	Profit/(loss) since purchase (USD)
Bonds						
5.75% Deutschland 1986-20.6.96	DEM	200 000	90.95	119 922.20	108 473.00	11 449.20
6.0% Deutsche Bundespost 1987-1.7.97	DEM	100 000	89.63	59 090.85	55 063.00	4 027.85
6.75% Europ.Investm.Bank 22.8.97	DEM	70 000	93.10	42 964.98	30 937.00	12 027.98
7% B.P. 1985-14.3.92	JPY	5 000 000	99.50	39 711.45	29 468.00	10 243.45
11.75% Nat.Westminster 1982-1.11.92	USD	100 000	105.13	105 125.00	99 230.17	5 894.83
6% UBS 1985-27.11.92	USD	150 000	100.62	150 930.00	134 352.11	16 577.89
7% Schweden 1987-12.2.92	USD	125 000	100.13	125 156.25	119 524.43	5 631.82
4.625% Nagasakiya 1987-12.3.92	CHF	100 000	98.75	72 985.14	66 447.00	6 538.14
6.75% Dow Chemical 1985-24.10.95	DEM	100 000	92.35	60 884.08	44 372.00	16 512.08
Sub-Total Bonds				776 769.94	687 866.71	88 903.23
Shares						
Shs Fidelity Magellan Fund	USD	9 092.53	68.61	623 838.48	443 472.91	180 365.57
Grand Total Securities				1 400 608.42	1 131 339.62	269 268.80

Auditors' Report

As auditors of the International Union of Pure and Applied Chemistry we have examined the accounts for the year ended 31 December 1991 in accordance with the provisions of Swiss law.

We have come to the conclusion that:

- the balance sheet and statement of income and expenses are in agreement with the books,
- the books of account have been properly kept,
- the financial position and the result of operations are presented in accordance with the principles of evaluation prescribed by Swiss law and the requirements of the statutes.

As a result of our examination we recommend that the accounts submitted to you be approved.

Neutra Treuhand AG
Zurich, 30 April 1992

Conferences

Excited state electron transfer
Pultusk, Poland
27 September–2 October 1992

IUPAC SPONSORED

An International Symposium on Experimental and Theoretical Aspects of Excited State Electron Transfer and Related Phenomena will be held in the Polonia Home, Pultusk, which is 60 km north-east of Warsaw from 27 September to 2 October. The symposium is being held in honour of Zbigniew R. Grabowski.

The symposium aims to bring together experimentalists and theoreticians working on excited state electron transfer (ET) and related phenomena.

The second circular lists 30 speakers who have confirmed their participation. Topics to be covered include kinetics of ET; theoretical description of ET processes, photocatalysis; solar energy conversion and storage, new devices and applications based on ET; photophysics of systems undergoing ET and other adiabatic photoreactions (e.g. proton transfer).

The registration fee, including registration, transportation (Warsaw–Pultusk–Warsaw), accommodation, meals and social programme is USD 600 for active participants and USD 500 for accompanying persons. IUPAC affiliates are entitled to a 10% reduction on the fee.

All participants will be staying at the Polonia Home, a renovated fourteenth-century castle, a former residence of Plock bishops, situated on a hill overlooking the Narew river. Meals will be served in the hotel which has club rooms, a night club, a library, a reading room as well as recreational facilities such as tennis courts and a landing place for boats.

A half-day excursion is planned, as well as several indoor and outdoor social events for the participants and accompanying persons.

Mycotoxins and phycotoxins
Mexico City, Mexico
8–12 November 1992

IUPAC SPONSORED

The IUPAC-sponsored 8th International Symposium on Mycotoxins and Phycotoxins will take place at the Stouffer Presidente Hotel at Chapultepec Park in Mexico City, Mexico.

This interdisciplinary symposium will focus on the significance and incidence of mycotoxin and phycotoxin contamination in agricultural commodities. Main topics of the scientific programme will include environmental factors leading to the contamination, methods for assessing and limiting human exposure to chemical contamination, recent advances in analytical methods, and the rationale for regulatory programmes.

The programme will consist of oral presentations, poster sessions and the following plenary lectures:

- Mycotoxins: occurrence (J. Gilbert, UK);
- Mycotoxins and animal health (A. C. Piers and J. Richard, USA);
- Mycotoxin control (van Egmond, The Netherlands);
- Mycotoxins and assessment of risk (T. Kuiper-Goodman, Canada);
- Mycotoxins in Central and South America (G. Bean, USA and R. Echandi, Costa Rica);
- Mycotoxins: historical overview (P. Steyn, South Africa);
- Foodborne diseases of marine origin (Y. Shumizu, USA);
- Seafood toxins: methodology (J. Lawrence, Canada);
- Ciguatera (Fr R. Bagnis, Polynesia and R. Dickey, USA);
- Tetrodotoxin (K. Yashumotot, Japan);
- Control of toxic seafood (S. Hall, USA);
- Freshwater cyanobacteria (W. Carmichael, USA);

The programme will also include poster sessions, and workshops together with a commercial exhibition and possibly satellite meetings.

The Mexico symposium will focus on the significance and incidence of mycotoxin and phycotoxin contamination in agricultural commodities.

Chemical education Bangkok, Thailand 17–21 December 1992

The 12th International Conference on Chemical Education will be held at the Central Plaza, Bangkok, Thailand.

The theme of the conference is 'Chemistry in transition'. This relates to the following areas:

- transition in the chemistry curriculum, for example, from subject-oriented to career-oriented curricula;
- transition in teaching methods, for example, from teacher- oriented to student-oriented methods;
- transition in teaching aids, for example, from chalk-and-board methods to audio-visual materials for self-study and also computer softwares.
- transition in newly emerging and newly industrialized countries and its impact on their chemical industries and education;
- transition in chemistry, biochemistry and molecular biology with reference to socio-economic, envlronmental and educational aspects.

The theme of the Bangkok International Conference on Chemical Education is 'Chemistry in transition'.

The scientific programme will consist of one opening lecture, five plenary lectures and 24 symposium lectures. The topics of the symposia are: Chemistry curriculum; Biochemistry curriculum; Frontiers in chemistry; Frontiers in biochemistry; Concepts and modern techniques in chemistry; Distance learning; Teaching aids; Publications in education journals.

In particular, these symposium will focus on:

Curriculum – secondary-school chemistry, first year university chemistry; the interface between secondary school and university teaching; chemistry and biochemistry for general education, marketing and modern living; emerging chemicals and biotechnological industries.

Textbooks – textbook forum on contents and syllabuses, textbook errors, textbooks for service teaching and for students in various disciplines.

Classroom teaching – audio-visual aids, production of teaching materials, psychology of chemical and biochemical education, lecture presentation.

Remote training programme – televised and radio programmes for open university, non-formal education, popularization classes.

Computers – computer-aided instructions, computer simulation, computers for tutoring, impact on approaches to teaching; locally-developed programs, data retrieval.

Lab demonstrations – VDO vs. actual experiments, microlab or miniaturization, open-end labs, relationship between lab and lecture, importance of labs at high-school level, low-cost experimentation.

Instrumentation – locally produced instruments, home-made instruments, familiarization with and assembly of electronic parts.

Miscellaneous – history of chemistry, chemistry olympiads, chemical and biochemical education for the environment, gadgets used in enhancing teaching and other topics of current interest to chemical and biochemical education.

The programme will include poster and oral sessions. There will also be workshops on low cost and locally produced equipment, the curriculum, computers in chemistry and biochemistry, teaching techniques and textbooks.

The conference language will be English. The proceedings will be published after the conference.

The registration fees in Baht (BHT) are BHT 9000 for participants and BHT 3000 for accompanying persons (USD 1.00 is equivalent to approximately BHT 26). IUPAC affiliates are entitled to a 10% reduction on the fee.

Hotel accommodation will be available at special conference rates ranging from BHT 1000 to BHT 3500 (single).

The average temperature during the day in Bangkok in December is 25–30°C. Casual and lightweight clothing is recommended.

Conference Calendar

Conference circulars and registrations forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in italics.

1992

Natural products

30 August–4 September.
18th International Symposium on Natural Products.
Strasbourg, France.
Ms. M.-Cl. Dillenseger & A. Cheminat, Centre de Neurochimie, 5 rue Blaise Pascal, 67084 Strasbourg, France. Tel: +33 (88) 376 767. Fax: +33 (88) 395 318. Telex: Palcost 890666F, mentioning "Congrès Louis Pasteur, IUPAC Symposium".

Raman spectroscopy

31 August–4 September.
13th International Conference on Raman Spectroscopy.
Würzburg, Germany.
Prof. W. Kiefer, Institut für Physikalische Chemie, Universität Würzburg, Marcusstrasse 9–11, W-8700 Würzburg, Germany.

How to apply for IUPAC sponsorship

To apply for IUPAC sponsorship, conference organizers should write to the IUPAC Secretariat (see inside back cover for address) requesting an Advanced Information Questionnaire (AIQ). Completed AIQs should be returned to the Secretariat preferably 2 YEARS and at least 12 months before the conference. Late applications will not be considered. Further information on granting of IUPAC sponsorship was published in *Chem. Intl.* **11** (1), 4–5 (1989).

CHEMRAWN VIII

7–10 September.
World Conference: Chemistry and Sustainable Development Towards a Clean Environment, Zero Waste and Highest Energy Efficiency.
Moscow, Russia.
Prof. V. A. Koptyug, Presidium of Russian Academy of Sciences, Leninskii Prospekt 14, 117901 Moscow, Russia. Fax: +7 (095) 230 2043/230 2630. Telex: 411964 ANS SU.

Nickel metabolism and toxicology

7–11 September.
5th International Conference on Nickel Metabolism and Toxicology.
Ontario, Canada.
5th International Conference on Nickel Metabolism and Toxicology, c/o Falconbridge Limited, Ms. Margaret Koski, Falconbridge, Ontario, Canada POM 1SO. Tel: +1 (705) 673 1161. Fax: +1 (705) 673 7666.

QSAR and Molecular Modelling

7–11 September.
9th European Symposium on Structure–Activity Relationships: QSAR and Molecular Modelling,
Strasbourg, France.
Alsace Congres/QSAR, 20 rue du Jeu des Enfants, B.P. 453 R10, F-67010 Strasbourg Cedex. Tel: +33 (88) 838 761. Fax: +33 (88) 221 830.

Medicinal chemistry

13–17 September.
12th International Symposium on Medicinal Chemistry.
Basel, Switzerland.
XIIth International Symposium on Medicinal Chemistry, PO Box, CH-4002 Basel, Switzerland. Tel: +41 (61) 696 6306. Fax: +41 (61) 696 7082. Telex: 963126.

Macrocyclic ligands

14–16 September.
International Symposium on Macrocyclic Ligands for the Design of New Materials.
Guildford, Surrey, UK.
Dr Angela F. Danil de Namor, Chairman, International Symposium on Macrocyclic Ligands for the Design of New Materials, Chemistry Department, University of Surrey, Guildford GU2 5XH, Surrey, UK. Tel: + 44 (483) 300 800, ext. 2588. Fax: +44 (483) 300 803. Telex: 859331 G.

Organic substances in soil and water

14–17 September.
International Conference on Organic Substances in Soil and Water.
Lancaster, UK.
Miss C. Martin, Centre for Research on Environmental Systems, Institute of Environmental and Biological Sciences, University of Lancaster, Bailrigg, Lancaster, LA1 4YQ, UK. Tel: +44 (524) 65201. Fax: +44 (524) 843 854.

Analytical chemistry

20–26 September.
SAC 92: International Conference on Analytical Chemistry.
Reading, UK.
The Secretary, Analytical Division, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V OBN, UK. Tel: +44 (71) 437 8656.

Excited state electron transfer and related phenomena

27 September–2 October.
International Symposium on Experimental and Theoretical Aspects of Excited State Electron Transfer and Related Phenomena.
Pultusk, Nr Warsaw, Poland.
Dr J. Waluk, Photochemistry & Spectroscopy Laboratory, Institute of Physical Chemistry, Polish Academy of Sciences, Kasprzaka 44/52, 01-224 Warsaw, Poland. Tel: +48 (22) 327 269. Fax: +48 (22) 325 276. Telex: 817097 ICHFPL.

Polymer spectroscopy

29 September–2 October.
10th European Symposium on Polymer Spectroscopy.
St Petersburg, Russia.
ESCOPS – 10th Organizing Committee, Dr Purkina A.V., Mrs. Kovalenko I.V, Institute of Macromolecular Compounds, Russian Academy of Sciences, Bolshoi Prospect 31, St. Petersburg 199004, Russia. Tel: +7 (812) 218 4001/213 1070. Fax: +7 (812) 218 6869.

Mycotoxins and phycotoxins

8–12 November.
8th International Symposium on Mycotoxins and Phycotoxins.
Mexico City, Mexico.
Dra. Magda Carvajal, Secretariado del Simposio, VIII Simposio Internacional IUPAC sobre Micotoxinas y Ficotoxinas, Insurgentes Sur 3700-C, Apartado Postal 101-63, 04530 México, D.F. Tel: +52 (5) 550 5883. Fax: +52 (5) 548 8207. Telex: 1774523 UNAMME.

Chemical education

17–21 December.
12th International Conference on Chemical Education.
Bangkok, Thailand.
Dr Somjai Wichaidit, The Chemical Society of Thailand, c/o Research Center, Ramathibodi Hospital, Rama VI Road, Bangkok 10400, Thailand. Tel: +66 (2) 245 9648 or 201 1447. Fax: +66 (2) 246 2123 or 201 1611.

1993

Thermodynamics of solutions and biological systems

3–6 January.
International Conference on Thermodynamics of Solutions and Biological Systems.
New Delhi, India.
Prof. J. C. Ahluwalia, Department of Chemistry, Indian Institute of Technology, Hauz Khas, New Delhi - 110016, India. Tel: +91 (11) 653 474/653 576 (office), +91 (11) 664 519 (home). Fax: +91 (11) 686 2037. Telex: 317 3087 or 316 1460 - IITD-IN.

Bioorganic chemistry

6–10 June.
2nd International Symposium on Bioorganic Chemistry.
Fukuoaka, Japan.
Symposium Secretariat, 2nd International Symposium on Bioorganic Chemistry, Department of Chemical Science and Technology, Faculty of Engineering, Kyushu University 36, Higashi-ku, Fukuoka 812, Japan. Fax: +81 (92) 632 1842.

Carotenoids

20–25 June.
10th International Symposium on Carotenoids.
Trondheim, Norway.
Prof. S. Liaaen-Jensen, Laboratory of Organic Chemistry, The Norwegian Institute of Technology, University of Trondheim-NTH, N-7034 Trondheim-NTH, Norway.

Cationic polymerization

5–8 July.
11th International Symposium on Cationic Polymerization and Related Ionic Processes.
Borovets, Bulgaria.
Prof. I. M. Panayotov, Institue of Polymers, Bulgarian Academy of Sciences, BG-1113 Sofia, Bulgaria.

Boron chemistry

11–15 July.
8th International Meeting on Boron Chemistry (IMEBORON VIII).
Tennessee, USA.
IMEBORON VIII, University of Tennessee Conference Center, PO Box 2468, Knoxville, TN 37901-2648, USA. Tel: +1 (615) 974 0250. Fax: +1 (615) 974 0268.

Optics and dynamics of polymers

12–15 July.
33rd Microsymposium on Macromolecules, Optics and Dynamics of Polymers.
Prague, Czechoslovakia.
33rd Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 6, Czechoslovakia.
Tel: +42 (2) 360 317.
Fax: +42 (2) 367 981.
Telex: 122019 IMCP C.

Fluorinated monomers and polymers

19–22 July.
34th Microsymposium on Macromolecules, Fluorinated Monomers and Polymers.
Prague, Czechoslovakia.
34th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162-06 Prague 6, Czechoslovakia.
Tel: +42 (2) 360 317.
Fax: +42 (2) 367 981.
Telex: 122019 IMCP C.

IUPAC General Assembly

5–12 August.
37th IUPAC General Assembly.
Lisbon, Portugal.
The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.

IUPAC Congress

15–20 August.
34th IUPAC Congress.
Beijing, China.
Prof. Xinqi Song, Secretary General of 34th IUPAC Congress, c/o Chinese Chemical Society, PO Box 2709, Beijing 100080, China. Tel: +86 (1) 256 8157 or 256 4020. Telex: 20035 CAST CN c/o CAST.

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all bona fide chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all bona fide chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

Solution chemistry

15–21 August.
23rd International Conference on Solution Chemistry.
Leicester, UK.
Dr M. J. Blandamer, Department of Chemistry, Leicester University, University Road, Leicester LE1 7RH, UK.

Macromolecule–metal complexes

30 August–3 September.
5th International Symposium on Macromolecule–Metal Complexes.
Bremen, Germany.
Prof. D. Wöhrle, Institute of Organic & Macromolecular Chemistry, University of Bremen, Leobener Str. NW 11, W-2800 Bremen 33, Germany.

Advanced polymer materials

6–10 September.
International Conference on Advanced Polymer Materials.
Dresden, Germany.
Prof. H.-J. Jacobasch, Institute of Polymer Research Dresden, PO Box 411, 0-8012 Dresden, Germany.

1994

Natural products chemistry

16–20 January.
19th International Symposium on Natural Products Chemistry.
Karachi, Pakistan.
Prof. Atta-ur-Rahman, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan.

Macromolecules

11–15 July.
35th International Symposium on Macromolecules.
Ohio, USA.
Dr J. P. Kennedy, Institute of Polymer Science, University of Akron, Akron, OH 44325-3909, USA.

Coordination Chemistry

24–29 July.
30th International Conference on Coordination Chemistry.
Kyoto, Japan.
Prof. H. Ohtaki, Laboratories of Coordination Chemistry, Institute for Molecular Science, Myodaiji-cho, Okazaki 444, Japan.

Physical organic chemistry

September.
12th International Conference on Physical Organic Chemistry.
Padova, Italy.
Prof. G. Scorrano, Dipartimento di Chimica Organica, Università degli Studi di Padova, Via Marzolo 1, 35100 Padova, Italy.
Fax: +39 (49) 831 222.

Organic Synthesis

December.
10th International Conference on Organic Synthesis.
Bangalore, India.
Prof. G. S. R. Subba Rao, Department of Organic Chemistry, Indian Institute of Science, Bangalore 560 012, India.

IUPAC Handbook 1991-1993

Published for the International Union of Pure and Applied Chemistry by Blackwell Scientific Publications Ltd.

The 1991-1993 Handbook is intended to provide, in one volume, detailed information on the membership, working programmes, and rules of operation of IUPAC. It will be a useful reference source for chemists and chemical organisations worldwide.

IUPAC

Outline of Contents: Organization of IUPAC 1991-1993; Table of contents for membership lists; International Union of Pure and Applied Chemistry; IUPAC officers and secretariat; Past officers of IUPAC; General assemblies and congresses of IUPAC; Membership lists of IUPAC bodies 1991-1993; National adhering organizations; Observer countries; Associated organizations; Company associates; Executive committee and bureau; Standing committees; Divisions/Section and their commissions, subcommittees, working parties and sub-groups; Standing orders from executive committee; Alphabetical index to members of IUPAC bodies 1991-1993; Current programmes 1992: Guidelines for IUPAC programmes; Standing committees; Divisions; Section; Appendix I - Reports published 1990-1991; Appendix II - Guidelines for applying for sponsorship of symposia, symposia sponsored by IUPAC (as at 31st March 1992); Appendix III - Procedure for comment and approval of IUPAC recommendations on nomenclature and symbols, guidelines for drafting IUPAC Recommendations 1992; Statutes and Bylaws; Appointment and functioning of national representatives; Rules of divisions; Terms of reference for divisions/section and commissions; Affiliate membership programme; List of abbreviations; Stop Press.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.
Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 44 countries, each represented by a national organization, such as an academy of science or research council.

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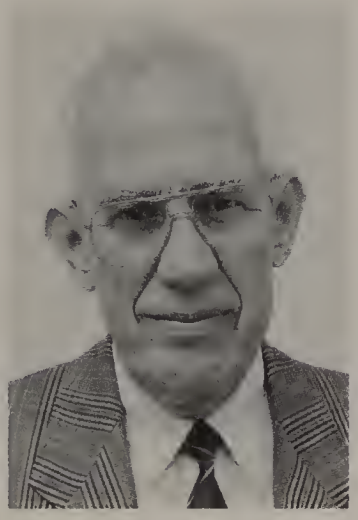
International Union of Pure and Applied Chemistry

Secretary General's Column

Prof. Gerrit den Boef

In his first Secretary General's Column, Prof. Gerrit den Boef focuses on the restructuring debate within the Union.

Prof. Gerrit den Boef.



Introduction

This is my first attempt to follow in the steps of my predecessor Prof. Tom West by writing a Secretary General's Column. The most appropriate time to do so is after a meeting of either the Executive Committee or the Bureau, or after a General Assembly. The Executive Committee met at the end of May in Dublin for routine business and to prepare for the Bureau meeting to be held at Oxford in September.

Restructuring

One of the main items on the agenda of the Dublin Executive Committee meeting was the restructuring of the Union. This item has been under discussion since the General Assembly at Boston in 1987, where the Bureau expressed its view that the Union's scientific programme and commission structure did not completely reflect the needs of the international community of chemists. Remarks were also made at the Council meeting in Boston on the static character of the Union. Divisions were therefore asked to study this problem and come forward with proposals at the Lund General Assembly in 1989.

Although a couple of commissions were discontinued at Lund, requests for the creation of a number of new commissions were made by the divisions. These were accepted in the form of Limited Life Time Commissions (LLTCs) with a life-time of 4 years to complete their specific tasks. The critical remarks on the static character remained and were again expressed at the General Assembly in Hamburg in 1991. Since then, the new team of officers has tried to breathe life into the discussion once again by starting a dialogue with the divisions and commissions in order to try to arrive at a common view on the future of the scientific policy of the Union. At the Council meeting in Hamburg, a few divisions expressed their willingness to examine carefully their scientific programmes in view of these critical remarks.

Survey

In a discussion by correspondence during the first half of 1992, it appeared that a few aspects had crystallized for the future design of the scientific programme of the Union. The main aspect on which there seems to be agreement is that we should try harder to work in areas of high priority. These areas can be better identified by also seeking the opinion of outside experts, such as colleagues not active in IUPAC, especially from industry, and editors of scientific journals. When this information is obtained in the year between general assemblies, we can expect to be in a better position to prepare projects for the next general assembly. New guidelines for IUPAC programmes were published in the *IUPAC Handbook 1991–93*. These guidelines more clearly defined which kind of scientific activities are suitable for the Union and which not.

Commission and division structure

Another aspect of restructuring is the question whether the present commission and division structure is the most appropriate for the implementation of the new attitude towards the scientific programme mentioned above, and whether all commissions should have about the same number of titular members. As yet, there is no common view on this point. However, it seems obvious that the discussion on the scientific programme must precede the election of members. Until now it has usually been done the other way round. Whatever, the outcome of the discussion on what the commission structure will be, we must always keep in mind the boundary conditions within which the scientific work of the

The question of restructuring was first raised at the IUPAC General Assembly in Boston in 1987.

The Union should cherish the goodwill of its members upon which it heavily relies.

Union has to be carried out. The most restrictive one is that full meetings of commissions only occur every 2 years at the general assemblies and that between USD 240 000 and 300 000 is available for divisions, including financing of mission-orientated programmes and for even-year activities between general assemblies. This sum of money supports the work of nearly 300 titular members and about 500 associate members together with subcommittee and working party members. It would be an eye-opener for some people criticizing the work of the Union to attend an even-year meeting of some commissions. I once visited an even-year meeting of a commission for which was available slightly more than USD 2000 to support its titular members. There was no symposium or other meeting at which members had to be present anyway. Nevertheless, 20 titular members, associate members, and subcommittee members from all parts of the world were present, some of them using private means, others obviously supported by their employers to an extent much larger than the IUPAC money obtained from the division. This is by no means an exception and it demonstrates the goodwill that exists for the Union. This should be carefully cherished.

Apart from these scarce meetings, everything has to be done by correspondence. Nevertheless, the scientific output of the Union is considerable and generally highly regarded. Even so, everybody seems to agree that we can still attain a better quality within our limited resources. Warnings, however, have been expressed, mainly from divisions and commissions, not to impose too drastic changes in the commission structure, as this structure represents the continuity of the scientific work within the Union. These voices suggest we use the term optimization rather than restructuring. So the debate continues. I expect that we can arrive at conclusions which satisfy a large majority of the IUPAC family and which will meet the objective to further improve the scientific work of the Union. It will be necessary, however, as soon as possible to lift the financial restrictions of the divisions. These restrictions were imposed at Hamburg because of the precarious state of finances of the Union.

Broader cooperation

Other means of broadening our scientific activities would be to increase our cooperation with other scientific bodies, of which the International Council of Scientific Unions (ICSU) is the first which comes to mind. ICSU has an impressive programme of interdisciplinary activities in which IUPAC plays a role of only minor importance. Most of the ICSU bodies are bio- or geo-orientated. We hope to improve this situation. A first good sign which can be reported is the fact that the Coordinator of the IUPAC Programme on Chemistry and the Environment, Prof. Valentin Koptyug, former President of the Union, has recently been elected Vice-President of ICSU's Scientific Committee on Problems of the Environment (SCOPE).

In Dublin, the Executive Committee decided that IUPAC should start to cooperate with the International Organization for Chemical Sciences in Development (IOCD). IUPAC representatives on a joint IOCD–IUPAC Working Party will be Prof. Valentin Koptyug, Dr Jacques Buffle and Dr Herman P. van Leeuwen. Another example of international cooperation is the implementation of an UNESCO–IUPAC contract for which our Past-President Prof. Yves Jeannin has assumed responsibility. It concerns a visiting professorship programme for Latin America. The first steps will hopefully be made by the end of this calendar year.

Prof. Valentin Koptyug has been elected Vice-President of SCOPE.

Granting of IUPAC sponsorship to symposia

IUPAC sponsors about 30 symposia (conferences, congresses, etc.) throughout the world each year. In order to apply for sponsorship, symposia organizers should first approach the IUPAC Secretariat in Oxford to obtain an Advanced Information Questionnaire (AIQ). Organizers should supply the information requested in the AIQ preferably 2 years before the actual meeting. The latest permitted date for receipt of a completed questionnaire by the Union is 12 months in advance. The granting of sponsorship by IUPAC is judged on the following criteria:

- scientific quality;
- significance of symposium or conference theme;
- suitability of proposed symposium or conference format;
- evidence of sufficient advanced planning;
- geographical rotation of location for symposia or conferences in a series or of a similar type;
- suitable time spacing of symposia or conferences of a similar type;
- rotation of leadership for symposia or conferences in a series or of a similar type.

The questionnaire is divided into 14 sections:

1. Title of symposium. Subsections if any. To what extent are parallel sessions planned? Main subject areas in chemistry covered by symposium: physical; inorganic; organic; macromolecular; analytical; applied; clinical; medicinal; environmental; advanced materials.

2. What are the aims and purposes of the meeting? Is the theme of special significance at the present time? What special contribution will the meeting make to the advancement of international chemistry? (*Organizers should have definite objectives for the scientific programme*.)

3. Proposed location (town and country). Proposed dates.

4. Approximate number of scientific participants expected.

5. Proposed registration fees: (i) for scientific participants; (ii) for students/younger chemists; (iii) is a contribution included towards the services of a professional convention organizer?

The level of registration fees should not be changed drastically without advising IUPAC. As a general principle IUPAC regards elaborate and expensive social events at meetings as undesirable. The cost of social events should not be included in the registration fee, which might otherwise hinder the attendance of younger chemists.

IUPAC sponsorship requires that its Affiliate Members are entitled to 10% reduction or 'own members' rate on the registration fee for scientific participants.

Arrangements, if delegated to a professional convention organizer, should be restricted to non-scientific matters.

6. Will any low cost hotel or dormitory accommodation be available?

7. Will there be an exhibition by manufacturers of scientific equipment or by publishers of scientific books and journals? IUPAC sponsorship requires that its main official publisher, Blackwell Scientific Publications, shall be allowed to display the publications of the Union free of charge.

8. It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend, irrespective of race, religion, or political philosophy.

Intending participants should be requested to check that they comply with any entry visa requirements by contacting the nearest embassy or diplomatic mission of the host country. If no such representation exists in a particular country, participants should consult the Organizers about the appropriate authority to contact. ***Organizers should seek in writing from their government an assurance that all visa applications made 3 months prior to the meeting will be dealt with not later than 1 month in advance***.

The granting of sponsorship by IUPAC is judged on scientific quality, significance of symposium or conference theme and other criteria.

If a visa is not granted or promised in writing 1 month before the date of the meeting and the applicants inform IUPAC, giving all details, ***sponsorship will be withdrawn by the Union***. The main invited lecturers will then be informed of any such decision and other meetings under the auspices of IUPAC in the country concerned will be suspended until more satisfactory circumstances exist. No financial responsibility for cancellation under these circumstances will be accepted by IUPAC.

Organizers must confirm that the following wording will be included in at least the second and subsequent circulars and in other relevant documentation:

> **"IUPAC sponsorship implies that entry visas will be granted to all bona fide chemists, provided application is made not less than three months in advance. If a visa is not granted one month before the meeting, the IUPAC Secretariat should be notified without delay by the applicant."**

IUPAC recommends that the second circular should be distributed no later than 6 months in advance of the meeting, so that intending participants are able to comply in good time with the Union's guidance on applications for entry visas.

9. (i) Names of other international/regional organizations, if any, to which application for co-sponsorship has been submitted. (ii) Names of national organizations, if any, which have agreed to sponsorship.

10. IUPAC reserves the right to publish in its official journal *Pure and Applied Chemistry* (or in book form) the whole or part of the proceedings of any symposium or conference which it sponsors. The publication of proceedings of a meeting co-sponsored with another international organization shall be the subject of special arrangements. Organizers should plan to make available to IUPAC 6 to 12 main lectures, some of which should survey critically the state of the particular field of research, giving pointers to future work. In some cases, however, it may be desirable for the Union to publish a somewhat larger number of lectures. Proposed scientific programme (the following items are not intended as the required format for all meetings): (i) Plenary lectures; (ii) Number of section or other invited lectures and time allowed for presentation of each; (iii) Number of contributed papers/short communications and time allowed for presentation of each; (iv) Number of posters; (v) Is there a refereeing policy for selection of contributed papers/short communications? (vi) Workshops/other sessions.

11. Is the symposium or conference part of a series? If so list the previous five meetings.

12. Is there an active and broadly representative International Advisory Committee in addition to the Local Organizing Committee? If so give names of members and their countries.

13. Name and address of proposed Symposium/Conference Editor. (If the proceedings or part of them are to be published by IUPAC, it is a condition of granting sponsorship that he organizers shall appoint a senior person as Symposium/Conference Editor well in advance.)

14. Name, address, telephone and fax number of Chairman and Secretary of Local Organizing Committee.

Having completed the AIQ, the organizers should return it to the Secretariat who then forward it to the appropriate IUPAC Division/Section President. The Division/Section President determines whether the scientific programme of the symposium is of the high standard commensurate with the granting of IUPAC sponsorship.

No symposium can be considered as sponsored officially unless it has gone through the necessary procedures, the first step being to obtain an AIQ from the IUPAC Secretariat.

The latest permitted date for receipt of a completed AIQ by IUPAC is 12 months in advance. The latest permitted date for granting sponsorship is 6 months in advance. The intention of these deadlines is to ensure that IUPAC's policy on entry visas is publicized in symposia second circulars, distributed no later than 6 months in advance.

The aim of the procedures described above is to give credibility to sponsorship by the Union. After confirming via the relevant Division/Section President that a symposium is of a high scientific standard, the granting of sponsorship should not be delayed unduly by publication considerations. Where necessary, provisional publication responsibilities are accepted by IUPAC, with a final decision to be made later.

23rd FECS General Assembly

The 23rd General Assembly of the Federation of European Chemical Societies (FECS) was held in Warsaw, Poland, on 22 June 1992. Fourteen of the 38 member societies were represented. The Slovenian Chemical Society was admitted to full membership, and the Estonian Chemical Society participated for the first time. It was agreed that, in the event no response is received to letters from the Secretariat over a period of 6 months, a Society's membership will be terminated.

The 23rd FECS General Assembly was held in Warsaw. Professor Jean-Baptiste Donnet became one of four new elected members of Council.

In addition to the FECS annual report for 1991, written reports were received from 10 Working Parties (Analytical Chemistry, Chemical Education, Chemistry and the Environment, Computational Chemistry, Conservation of the Cultural Heritage, Electrochemistry, Food Chemistry, History of Chemistry, Organometallic Chemistry, Professional Affairs) and from the FECS Network on Chemistry and Developing Countries. It is hoped that the EUCHEM Conferences Committee will become a FECS Working Party in the near future.

Various modifications to the Statutes were approved, which will facilitate the re-issuing of the information booklet on FECS, its member societies, and the Working Parties. Active contact has been re-established with the Federation of Asian Chemical Societies, and consideration is being given to holding some EURASIA Conferences. Ten European meetings were sponsored by FECS during 1991.

Guidelines for Education and Training in Analytical Chemistry, as resolved at EUROANALYSIS VII (Vienna, 1990), have gained significant attention and recognition, both inside and outside Europe, as a tool to facilitate student exchange at a high and competitive level in analytical chemistry. The handbook *Education and Training in Chemistry in Europe* was published with UNESCO funding towards the end of 1991. Four Working Parties organized the ENVIRONMENT '92 Conference at Budapest in May, and a declaration of 8 recommendations was formulated for publication in national chemistry journals and for presentation to the UN Conference on Environment and Development (Rio de Janeiro, June 1992). It was generally agreed to hold — with assistance from Société Française de Chimie — a major conference on computational chemistry in Spring 1994 in the vicinity of Nancy.

The 10th FECHEM Conference on Organometallic Chemistry is scheduled for Agia-Pelagia in Crete during September 1993. Regarding Conservation of the Cultural Heritage, the main activities will be through Working Groups on stone, paintings, and metals. The Working Party on Professional Affairs received information on "responsible persons" and women chemists, from which summary reports were produced. The proceedings of the Conference on Chemistry and Developing Countries (London, April 1991) will be published by the UK Royal Society of Chemistry in Autumn 1992, and the FECS Network will then consider appropriate recommendations.

At the end of the Assembly, Dr R. Darms (Swiss Committee for Chemistry) succeeded Dr W. Fritsche (Gesellschaft Deutscher Chemiker) as President (previously Chairman), which acts for the Federation during the intervals between the annual General Assemblies of the FECS Council. Dr Fritsche was one of the active founders of the Federation at Prague in 1970. Four vacancies for elected members on the Council — one arising from the untimely death of Dr V. Chvalovsky (Czechoslovak Chemical Society) — were filled by Prof. J.-B. Donnet (France), Prof. F. Hensel (Germany), Prof. L. Skattebol (Norway), and Prof. A. Zamojski (Poland). As an exception to the Statutes, but in order to ensure a better continuity in rotation of elected members, Ing. E. J. de Ryck van der Gracht (Netherlands) will remain a member of Council for an extra year.

Mo Williams

New ISO Technical Committees on Surface Chemical Analysis and Microbeam Analysis

The May 1992 issue of *ISO Bulletin* reports that the International Organization for Standardization (ISO) has given the green light to Technical Committees on Surface Chemical Analysis (SCA) and Microbeam Analysis (MBA). These are ISO TC 201 and ISO TC 202 respectively.

According to this report, international trade in both surface-dependent materials, e.g. Si-wafers, epitaxial multi-layer devices, and surface chemical analysis instruments, is increasing rapidly and some industries face trade barriers caused by disagreement between users and suppliers of the materials in relation to surface characterization data. Problems arise not only in relation to analytical instruments themselves, but also in materials, the main characteristics of which are determined by the surface chemical composition but no by bulk composition, due to differences in methods of qualification as well as lack of reference materials and reference data.

International standardization in this field seems therefore to be timely since the fundamental principles of SCA have been established and stabilized; and harmonization of requirements concerning the main characteristics, accuracy, precision, etc., relating both to surface — and near surface region-chemical analysis techniques and related instruments need to be promoted. The advantages gained from international standardization in this field would benefit the SCA instrument makers, instrument users, suppliers and users of surface-dependent materials.

Microbeam analysis is an important field of instrumental analysis, referring to the comprehensive technique of structural analysis of solid state materials or product employing microbeam techniques using electrons, ions and radiation, sophisticated instruments such as the electron probe microanalyser (EPMA), ion microprobe mass analyser (SIMS), scanning electron microscope (SEM), analytical electron microscope (AEM), laser microprobe mass analyser (LAMMA). Some of these techniques are also used in surface chemical analysis.

Microbeam analysis has increasingly become an applied comprehensive testing method for quality standards and quality control in modern industry and high technology, for basic analysis in scientific research and for commodity inspection in international trade. Structural analysis is essentially a comparative (relative) method, its quantification depending crucially on experimental methods and associated reference materials.

Analytical data and results from different laboratories in one country, and from laboratories in different countries often cannot be compared due to the lack of standardized methods and the absence of reference materials, thereby causing difficulties in international exchange, cooperation and trade in various fields depending upon the testing results by microbeam analysis.

In some cases, the same instrument, for example, the SIMS, may be used both in MBA and SCA. However, this does not necessarily mean that an overlapping of responsibility will arise between the two TCs. This is so because there

are two different operating modes with SIMS. One referred to as static SIMS and characterized by a primary ion beam of large size, low energy and low current density, deals with the problem of SCA, another referred to as dynamic SIMS and characterized by a primary ion beam of small size, high energy and high current density, deals with the problem of MBA. As for EPMA, it should mostly be regarded as the instrumentation of MBA because under normal operating conditions the penetration and scattering of impinging electrons into the materials and the X-ray information thus provided would place the analysis outside the scope of SCA.

From the descriptions it is clear that the two technologies are closely related and, in view of technological development and expanding applications, crossfires may occur between the respective areas of work of standardization between MBA and SCA. The plenary meetings of these TCs were held consecutively at the beginning of July 1992 in Japan for ISO/TC 201 and in China for ISO/TC 202.

Gems in the history of chemistry — Part II

A chemistry textbook published in 1879 noted that naphthalene is unimportant and that the name of the compound with the formula C_6H_6 is 'sextune.'

The second historic gem submitted by Stanley Brown, Past-President of the Clinical Chemistry Division (see *Chem Intl.* **13**, 85, 1991), concerns hydrocarbons. The gem is taken from 'Part III — Organic' of *Aids to Chemistry* ('specially designed for students preparing for examination') by C. E. Armand Semple and published in London in 1879 by Bailliere, Tindall & Cox.

Pages 21–23 deal with 'Hydrocarbons with an even number of hydrogen atoms.' These are divided into 12 series, the first being the homologous series of paraffins (alkanes):

1st Series. C_nH_{2n+2}. Paraffins. These are all saturated hydrocarbons, and receive this name since, by being saturated, they have no tendency to unite with other substances (parum, but little; affinis, related).

Sixteen members of the series are then listed: methane, CH_4 right through to 'sexdecane', $C_{16}H_{34}$. We then learn that:

The first four are gaseous, the remainder liquids. They occur in nature, but may also be prepared artificially in the following modes:

- by acting upon alcoholic iodides with metallic zinc;
- by the dry distillation of cannel coal and boghead etc.

Each successive series is then detailed. For the 8th series we read:

8th Series. C_nH_{2n-12}. Naphthalene, $C_{10}H_8$ is the one that has been procured, and this is unimportant.

Finally, there the nomenclature of members of the first five series is summarized in the form of a table:

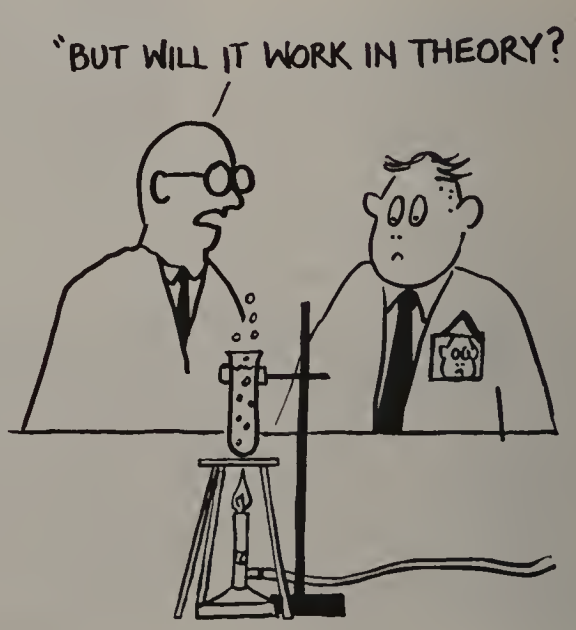
The following table is a good illustration of these series; the first six, however, are only included with the names given them by Hofman, who has adopted the five vowels, a, e, i, o, u, the terminations being -ane, -ene, -ine, -une, respectively. Thus:

1st series *Paraffins*	2nd series *Olefines*	3rd series	4th series	5th series	6th series	7th series
CH_4 Methane	CH_2 Methene					
C_2H_6 Ethane	C_2H_4 Ethene	C_2H_2 Ethine				
C_3H_8 Propane	C_3H_6 Propene	C_3H_4 Propine	C_3H_2 Propone			
C_4H_{10} Quartane	C_4H_8 Quartene	C_4H_6 Quartine	C_4H_4 Quartone	C_4H_2 Quartune		
C_5H_{12} Quintane	C_5H_{10} Quintene	C_5H_8 Quintine	C_5H_6 Quintone	C_5H_4 Quintune	C_5H_2	
C_6H_{14} Sextane	C_6H_{12} Sextene	C_6H_{10} Sextine	C_6H_8 Sextone	C_6H_6 Sextune	C_6H_4	C_6H_2

If this table be read from above downwards, an *Homologous* series is presented, each differing from the one immediately above or below it by CH_2; if read from left to right, an *Isologous* series appears, each molecule possessing H_2 less than the one preceding.

Theory *versus* practice

In the 'Endpoint' column (page 28) of the January 1992 issue of *Education in Chemistry*, Graham Hills (University of Strathclyde, Glasgow, UK) discusses the omnipresent tug-of-war between theory and practice in science in general and in chemistry in particular. Hills considers that 'an ounce of experiment is worth a ton of theory.' He suggests that we should pay more attention to teaching experimental skills and a little less to correlations masquerading as theories. The theory, states Hills, is the safe haven of so many uncertainties and uncertain people, whereas reality cannot be ducked, fiddled or fudged. Hills opens the column by quoting one elderly don who said about a successful experiment, 'That's all very well in practice, but will it ever work in theory'?



Letter to the Editor

Amount of chemical substance expressed in moles: molar amount

Sir,

I was surprised to learn from the report by Prof. Cvitaš, (*Chem Intl.* **14**, 100, 1992) that the discussion of *amount of substance*, *chemical amount*, and similar meaningless and ambiguous terms for the amount of a chemical substance expressed in moles is still going on. As I pointed out five years ago (*J. Chem. Educ.* **64**, 246, 1987) terminology which has been in existence for many years is quite adequate for logical, self-defining, and unambiguous expression of this and related concepts.

It would be helpful to place the terms mentioned in that article in a broader framework. In the following, each indented item is a subdivision of the unindented item next above it:

amount	concentration
• mass	• mass concentration
• volume	• volume concentration
• particulate amount	• particulate concentration
number of particles	particle concentration
molar amount	molar concentration
	molarity
equivalent amount	equivalent concentration
	normality

Of these, the most significant is *molar amount*, which is not really a new term, for the amount of a chemical substance expressed in moles. Only *particulate amount* and *particulate concentration* are somewhat unusual; it is not suggested that these terms be used frequently, but only that they are available for completeness of terminology. Of course, *particle* may be replaced by *atom*, *molecule*, *electron*, *ion*, *neutron*, *photon*, *micelle*, *aerosol*, *grain*, etc., as appropriate.

For most of these quantities, the generalization applies that there may be various units. However, for those bearing the adjectival qualifier *molar* or *equivalent*, the unit for amount is restricted to *mole* or *equivalent*, respectively. (Units modified by k, c, m, μ, etc., are not considered as categorically different.) Moreover, for *molarity* and *normality*, the units are further restricted to *mole/liter* (*molar*) and *equivalent/liter* (*normal*), respectively.

Truman P. Kohman,
Department of Chemistry,
Carnegie Mellon,
Pittsburgh,
Pennsylvania,
USA

Affiliate Membership 1992

The following review is based on the report which Affiliate Affairs Secretary Michael Freemantle presented to the Committee on Affiliate Membership (CAM) when it met in Oxford in September 1992.

Introduction

The principal aims of the Affiliate Membership Programme (AMP) are:

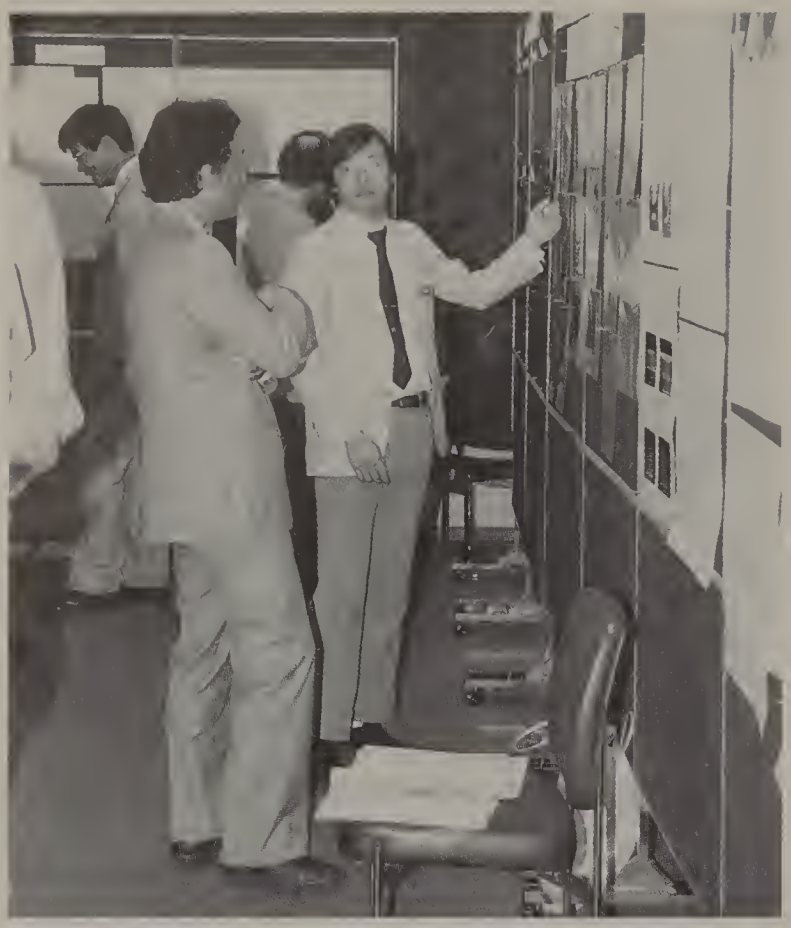
1. to maximize the participation of chemists world-wide in the affairs of IUPAC;
2. to disseminate information about IUPAC, its activities and its output to a much wider audience.

AMP operates principally through the national chemical societies of member countries (National Adhering Organizations). The societies are responsible for:

- promoting AMP in their respective countries — principally through their national chemistry journals/magazines;
- collecting AMP subscriptions and submitting the IUPAC component of these to IUPAC;
- providing the IUPAC Secretariat in Oxford with numbers, names and addresses of affiliates;
- distributing the IUPAC news magazine *Chemistry International* to affiliates (we arrange, through the publishers Blackwell Scientific Publications, for bulk copies of the magazine to be sent to each member country for distribution).

AMP also operates in some non-member developing countries which do not have a national chemical society. In each of these countries we have established links with a key individual, known as a National Affiliate Membership Secretary, who is responsible for operating AMP in that country.

In addition, the IUPAC Secretariat administers directly an AMP list of (currently) 112 chemists who are unable to join the programme through the above mechanisms. For example, ACS in the USA and RSC in the UK both impose residence requirements on their members who wish to enrol as IUPAC affiliates. Thus, an ACS or RSC member working in a developing country may become an affiliate by registering directly through the IUPAC Secretariat.



The Affiliate Membership Programme aims to disseminate information about IUPAC and its activities to chemists world-wide.

A particular feature of AMP is the opportunity for young chemists in developing countries to become affiliates free of charge. This has been possible because of funds initially made available by UNESCO/ICSU and in recent years by IUPAC.

In order to promote AMP, about 200 000 copies of a promotional leaflet were printed and sent to national chemical societies for distribution to members in 1985. This operation was repeated in 1986 and 1988. In addition, copies of these leaflets have been sent to IUPAC sponsored conferences for display at registration/for inclusion in registration envelopes.

Staffing of AMP

The Affiliate Affairs 'Section' at the IUPAC Secretariat is staffed by three persons all working on a part-time basis:
(a) Dr Michael Freemantle is Affiliate Affairs Secretary and also Editor of *Chemistry International* and Information Officer. In regard to the latter we receive over 500 mail and telephone enquiries each year. He is also responsible for IUPAC publicity (leaflets, posters, photograpy, press releases, press conferences and so on).
(b) Mrs Mary Patterson (Secretarial Assistant to Dr Freemantle). Mrs Patterson also has responsibility for IUPAC Reception at the Secretariat.
(c) Mrs Gill Crook (Affiliate Membership Assistant). Mrs Crook is responsible for operating the affiliate database and assisting with enquiries.

The *Chemistry International*, Affiliate Affairs and Information sections at the IUPAC Secretariat is staffed by a total of 2.50 persons of which 0.85 is allocated in the magazine, 0.80 to Affiliate Affairs and 0.85 to information activities.

Membership numbers

The trends in membership since AMP was launched in 1986 are shown in Table 1.

Table 1. Affiliate Membership numbers

Year	USA	Developing Countries	Eastern Europe	Other	**Total**
1986	4412	293	10	872	5587
1987	5125	738	324	1669	7856
1988	4653	821	396	1637	7507
1989	4674	866	457	2077	8074
1990	4251	667	551	1986	7464
1991	3911	938	360	1750	6959
1992*	3752	967	349	1755	6825

* Numbers at 92.07.08

These figures are determined from the membership lists submitted to the Secretariat. They show a decrease in membership since the all-time high of 8074 in 1989. The decrease over recent years is principally due to (a) a decrease in membership in USA and (b) decrease in membership in Eastern European countries.

Membership in the Third World continues to be encouraging. The above figures show the total membership of both young chemists sponsored by IUPAC and other Third World chemists who pay the full subscriptions. The total number of sponsored affiliates in 1992 to date is 753.

Subscriptions

Table 2 shows the IUPAC components of the affiliate subscriptions since AMP started in 1986 together with the breakdown of the allocation of this subscription to Blackwell Scientific Publications (for each affiliate copy of *Chemistry International*) and IUPAC:

Table 2. Affiliate subscriptions (in USD)

	IUPAC component of affiliate subscription	Payment to BSP for *CI*	Payment to IUPAC
1986	7.50	5.00	2.50
1987	7.50	5.00	2.50
1988	12.00	7.50	4.50
1989	12.00	7.50	4.50
1990	12.00	7.50	4.50
1991	12.00	7.50	4.50
1992	13.00	8.50	4.50
1993	13.00	8.50	4.50

National subscriptions consist of two components: (a) the IUPAC component shown in Table 2 and (b) a national component to cover administration and postage costs. Some national subscriptions are shown in Table 3.

Table 3. National subscriptions for 1992

Country	Subscription
Belgium (Societé Royale de Chimie)	BEF 900
Canada	CAN 34
Czechoslovakia	CSK 430
France	FRF 200
Italy	ITL 30 000
Ireland	IEP 17
New Zealand	NZD 25.50
Republic of South Africa	ZAR 40
Romania	ROL 2400
Russia	SUR 27
Sweden	SEK 200
UK	GBP 15
USA	USD 27

The 1992 subscription for affiliates administered by IUPAC Secretariat is GBP 17.

Benefits for affiliates

Standard affiliate benefits such as reduced conference fees and discounts on the costs of IUPAC publications continue. BSP now offer upto 40% discount to affiliates for some of their IUPAC titles.

An envelope containing the following items was inserted into affiliate copies of the May 1992 issue of *Chemistry International*:

- a letter explaining the benefits of affiliate membership;
- a blue laminated card containing the *Table of Standard Atomic Weights 1989*;
- a membership card;
- a membership certificate;
- a registration form.

At the beginning of 1991, the affiliate computer database produced a list of affiliates for each Commission based on the specific interests of the affiliates recorded on their registration forms. In March 1991, these lists were sent out to the Commissions together with a letter from the Secretary General encouraging Commissions to recruit affiliates where appropriate. Letters were also sent to Division/Section Presidents and Secretaries. Feedback received at the IUPAC Secretariat indicated that several Commissions actively pursued the recruitment of affiliates.

At Hamburg, CAM agreed that sets of Provisional Recommendations should be sent for comment to 20 or so affiliates selected on a geographic basis and also on their expressed interest in the work of the Commission generating the recommendations. This is now in operation.

So far this year three sets of Provisional Recommendations have been sent out to selected affiliates.

Computer database

Affiliate membership data extracted from national membership lists and registration forms are loaded onto the Affiliate Membership Computer Database at the IUPAC Secretariat. The database is used for a variety of purposes, the principal being (a) to select affiliates with a specific interest (see above) and (b) to verify membership of affiliates who have requested specific membership concessions.

Earlier this year, computer facilities at the IUPAC Secretariat were networked. At the time of writing a combined IUPAC Committee and Affiliate Membership Database is being commissioned. Plans are for the database to become fully operational in time for 1992 affiliate registration information to be loaded by end of this year.

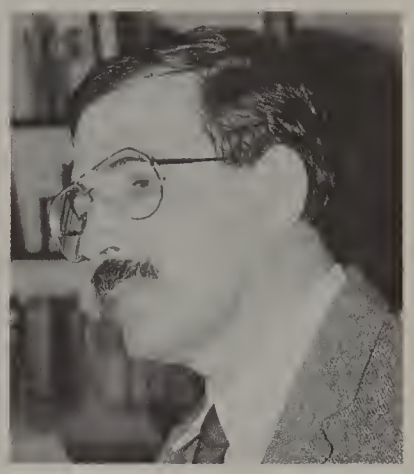
Recruitment

The Committee on Affiliate Membership (CAM) has always been keen to encourage IUPAC Bureau, Committee and Commission Members to become IUPAC Affiliates. At the Hamburg meeting, CAM proposed that President Bard should send a letter to all members inviting them to sponsor an IUPAC affiliate in the Third World. In effect, members who agreed to do this, would be donating their (paid for) affiliate copy of *Chemistry International* to a Third World chemist, whilst retaining their (free) IUPAC member's copy.

Accordingly, a letter was sent out by Bard in September 1991. The IUPAC Secretariat has learnt of several positive responses to this initiative.

The IUPAC Secretariat is located on the top floor of this building in Cowley, Oxford. Secretariat computing facilities were networked in 1992 and a combined IUPAC Committee and Affiliate Membership Computer Database is currently being commissioned.

Affiliate Affairs



Prof. Venčeslav Kaučič on a visit to the IUPAC Secretariat in Oxford in January 1992.

Slovenian affiliates

Earlier this year, Slovenia became an IUPAC Observer Country. The Slovenian Chemical Society has now registered 51 chemists as IUPAC affiliates — 29 of whom are based in Ljubljana. The Secretary of the Slovenian Chemistry Society and IUPAC Affiliate Membership Secretary in Slovenia is Prof. Venčeslav Kaučič. He was responsible for establishing contacts with IUPAC and initiating the Affiliate Membership Programme in Slovenia when he visited the IUPAC Secretariat in Oxford on 8th January 1992.

For further information about IUPAC activities in Slovenia, please contact: Prof. Venčeslav Kaučič, Secretary, Hajdrikhova 19, 61115 Ljubljana, Slovenia.

Boron grants

The 8th International Meeting on Boron Chemistry will take place at the University of Tennessee, Knoxville, USA, on 11–15 July 1993 (see page 235). A limited number of grants will be awarded to qualified graduate students and postdoctoral research associates who wish to make presentations. The awards will be competitive. Applicants for the grants should submit a letter from their research advisor, a brief curriculum vitae, and an application letter which includes a description of the research to be presented and the amount of funds requested.

Please send the application to Professor George W. Kabalka, IMEBORON VIII Chemistry Department, University of Tennessee, Knoxville, TN 37996-1600, USA. Fax: +1 (615) 974 2997.

Global Climate Observing System

The 2nd World Climate Conference held in Geneva in 1990 called for the creation of a Global Climate Observing System (GCOS). The operational framework fo GCOS has now been established by the organizations co-sponsoring the development of GCOS, namely the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the United Nations Environmental Programme (UNEP), and the International Council of Scientific Unions (ICSU).

These organizations have established a Joint Scientific and Technical Committee (JSTC) for GCOS supported by a Joint Planning Office (JPO), housed in the WMO headquarters in Geneva. The JPO has recently published a booklet describing the concept and aspirations of GCOS.

The booklet and further information about GCOS is available from: Dr T. W. Spence, Director of the Joint Planning Office, Global Climate Observing System, c/o World Meteorological Organization, PO Box 2300, CH-1211 Geneva 2, Switzerland. Tel: +41 (22) 730 8401. Fax: +41 (22) 740 1439. Telex: 414199 OMM CH.

Aerial view of the campus of the University of Tennessee, Knoxville where IMEBORON VIII will be held. Applications are invited for a limited number of grants to attend the meeting.

Information for affiliates

Have you returned your affiliate registration form?

Every affiliate receiving a copy of the May 1992 issue of *CI* should have found, inserted in the magazine, a white envelope addressed to affiliates. The envelope contained several documents including a red IUPAC affiliate membership registration form. This should be completed and returned to the IUPAC Secretariat before 31 October 31 1992.

The information on the form will be entered on to the IUPAC Affiliate Membership Computer Database. The database will be used to help promote the visibility of affiliates as potential recruits for the scientific work of IUPAC. In particular, names and addresses of affiliates expressing an interest in the work of a commission will be submitted to that commission early next year.

Increased discount for affiliates

IUPAC affiliates are entitled to a 40% discount on the price of the 1st Supplement to the 7th Edition of *Standard Methods for the Analysis of Oils, Fats and Derivatives* which was published in May this year. For details and a review of the supplement see page 189.

IUPAC publications

Affiliates are entitled to a 25% reduction and in some cases a 40% reduction on the cost of IUPAC publications except the scientific journal *Pure and Applied Chemistry*. A leaflet detailing IUPAC books currently available from Blackwell Scientific Publications has recently been distributed by the publishers to all *CI* readers. Further copies may be obtained from the IUPAC Secretariat.

IUPAC poster

Copies of an IUPAC poster (see page 214 of the November 1990 issue of *CI*) are available **free of charge** to affiliates and members of IUPAC's commissions and committees. The poster is printed in blue and black on a white background and is approximately 42 x 59 cm in size.

IUPAC welcomes any publicity you can give to its activities. If you would like to display one or more copies of the poster in your department or elsewhere please write to the Affiliate Affairs Secretary stating your name and address and how many copies of the poster you wish to receive.

Free copies of booklet available to affiliates

Copies of an attractive 64-page illustrated booklet on *The IUPAC Programme on Chemistry and the Environment* have been distributed to members of IUPAC commissions and committees, national adhering organizastions and other bodies associated with IUPAC.

Copies are still available free of charge to IUPAC affiliates. To apply for a copy, please write to the Affiliate Affairs Secretary.

Address of IUPAC Secretariat

Please use the following address for all communications directed to the IUPAC Affiliate Affairs Secretary. If you are submitting a letter for publication in *Chemistry International* (*CI*), please indicate that the letter is 'Submitted for publication in *CI*.'

Affiliate Affairs Secretary
IUPAC Secretariat
Bank Court Chambers
2-3 Pound Way
Templars Square
Cowley
Oxford OX4 3YF
UK

Tel: +44 (865) 747 744
Fax: +44 (865) 747 510
Telex: 83147 VIA
OR G attn. IUPAC

ICSU's role in international science

A booklet entitled *ICSU and its Role in International Science: A Brief Overview of the International Council of Scientific Unions* has recently been published. IUPAC is one of the 20 Union members of ICSU.

For further information contact: ICSU Secretariat, 51 Boulevard de Montmorency, 75016 Paris, France. Tel: +33 (1) 45 25 03 29. Fax: +33 (1) 42 88 94 31. Telex: 645554 F. Telegrams: ICSU Paris 016. E.Mail: Telecom Gold 10075:DBI0126. Omnet: ICSU.PARIS. Econet:ICSU.

IUPAC-sponsored conferences

If you are interested in attending a conference please apply directly to the conference organizers for the conference circulars and registration forms. An updated list of names and addresses of the organizers of all future IUPAC-sponsored conferences is given in the 'Conference Calendar' published in each issue of *CI*.

Affiliate reduction of conference registration fees

It is a condition of IUPAC sponsorship of a conference that IUPAC affiliates are entitled to a 10% reduction or 'own members' rate on the registration fee for scientific participants. This concession is usually – but not always – announced in the conference circulars and indicated on the registration form.

To receive this reduction an affiliate must declare on the conference registration form that (s)he is an affiliate. Alternatively the affiliate should apply in writing to the conference organizer for this reduction stating that (s)he is an affiliate. Conference organizers may check with the IUPAC Secretariat that applicants for this reduction are currently registered as affiliates.

If an application for this reduction is refused, an affiliate should immediately notify the Affiliate Affairs Secretary and, if possible, forward copies of documentary evidence of this refusal

Commission & Committee News

IUPAC Database Procedures guidelines

The following guidelines for IUPAC bodies undertaking database projects were prepared by the Committee on Chemical Databases (CCDB). The Guidelines were approved for publication by the Executive Committee at its meeting in Dublin in May 1992.

1. In order to start a database project a Project Initiation Proposal Form (available from the IUPAC Secretariat) must be completed by an IUPAC body, endorsed if necessary by the relevant Division/Section President, and then sent to the IUPAC Secretariat with a copy to the Chairman of CCDB.

2. The Project Initiation Proposal Form must include the name(s) of the Coordinator(s) for the database project.

3. Data content and data quality are the responsibility of the IUPAC body in charge of the project.

4. The coordinator is responsible for ensuring that all copyright and ownership issues are defined and resolved, so that IUPAC can disseminate the database project results. Legal questions should be addressed to the Secretary General at the IUPAC Secretariat.

The completed Project Initiation Proposal Form should contain:

(a) a short description of the database and software;

(b) a short statement regarding any similar or related databases and software in this field;

(c) a shcrt description of how the work will be undertaken, including a timetable for its completion;

(d) a request for any financial support needed from IUPAC (hardware, software, data entry funding, etc.).

5. dBase is the IUPAC recommended software data entry and data search software. At the September 1990 Meeting of the IUPAC Bureau dBase was approved as the recommended retrieval software for IUPAC computerization projects, and ASCII was recommended as the standard format for the data. The dBase software, together with the related Clipper software for compiling dBase code, will be provided at no cost to any approved IUPAC database project, which requires these software products.

6. CCDB will review and recommend to the IUPAC Bureau that a database project should definitely be started. It will also request funding from IUPAC, as necessary, via the Treasurer for the work to be started.

7. The responsibility for testing the computer system resides with the IUPAC body which has initiated the project. Additional testing will be undertaken by CCDB prior to any release of the computer system.

8. When the project is within a few months of being ready for public dissemination, CCDB will initiate the necessary contractual activities to distribute the database and software project.

9. The Coordinator is responsible for the writing of the computer system manual, the updates and corrections of the database and software, and answering and technical questions from users.

10. When the Coordinator is no longer involved in the project, the relevant IUPAC body will either withdraw the computer system from distribution by writing to CCDB or name a new Coordinator to continue the project.

Laser spectroscopy nomenclature

The Commission on Spectrochemical and other Optical Procedures for Analysis (V.4) met in Berlin, Germany, on 21–22 June 1992.

The Commission discussed the status of the various nomenclature documents on different aspects of laser-based spectroscopy currently in preparation. Rationalization of Parts XVI and XVIII has resulted in a restriction of their contents and will be retitled 'Laser-based molecular spectroscopy: luminescence' and 'Raman spectroscopy' respectively. The section removed from the original concept of Part XVI on laser-based molecular absorption spectroscopy will be proposed as a new document, Part XXI.

A revised draft of Part XVI was reviewed in detail and Dr T. Vo-Dinh will circulate a new draft incorporating the changes for comments by the Commission members. Changes in the Commission's membership and the scope of the Commission's programme after the 1993 General Assembly in Lisbon were also discussed.

The Commission planned a minimeeting to take place in Wurzburg, Germany, on 4–5 September 1992.

How to contact commissions

IUPAC affiliates are entitled to communicate directly on scientific matters with the officers of IUPAC comissions. A full list of names and addresses of all commission officers for 1991–93 was published on pages 223–233 of the November 1991 issue of *CI*. Photocopies of this list are available upon request from the Affiliate Affairs Secretary.

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of commission and committee chairmen and secretaries and IUPAC officers were published in *Chem. Intl.* **13**, 223–233 (1991). The IUPAC Secretariat has been notified recently of the following changes:

Dr A. Hayes (Chairman, CHEMRAWN Committee). 'Highlands', Friday's Hill, Fernhurst, Haslemere, Surrey GU27 3LL, UK. Tel: +44 (428) 6522342. Fax: +44 (428) 658449.

Dr S. R. Heller (Chairman, Committee on Chemical Databases). Tel: +1 (301) 504 6055. Fax: +1 (301) 504 6231.

Dr P. T. Holland (Secretary, Commission on Agrochemicals). Ruakura Research Centre, Ruakura Road, Private Bag 3123, Hamilton, New Zealand. Tel +64 (7) 856 2835. Fax: +64 (7) 838 5507.

Dr A. E. Pohland (Chairman, Commission on Food Chemistry). Tel: +1 (202) 205 4036. Fax: +1 (202) 205 4422.

Prof. K. V. Sané (Chairman, Committee on Teaching of Chemistry). Fax: +91 (11) 725 7161.

Provisional Recommendations

Symmetry, selection rules and nomenclature in surface spectroscopies

The widespread use of techniques such as vibrational spectroscopy and photoelectron spectroscopy for the investigation of adsorbates on single crystal surfaces has focused attention on the symmetry properties of adsorbed molecules and on the application of selection rules. In much published work, however, confusion exists as to the appropriate point groups and, in the case of ordered overlayers, the appropriate space groups. In this document, the symmetry properties of clean and absorbate-covered single crystals are described, appropriate nomenclature suggested and the physical principles leading to selection rules in surface spectroscopies briefly listed.

Comments on the document are welcome and should be sent by 31 March 1993 to: Prof. A. M. Bradshaw, Fritz-Haber-Institut der Max Planck Gesellschaft, Faradayweg 4–6, D-1000 Berlin 33, Germany.

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomennclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *Chem. Intl.* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of the national/regional centres appeared in *Chem. Intl.* **14**, 25 (1992).

PAC Review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols, and technical reports appearing in *PAC* are published in *Chem. Intl.* in the section Recent Reports. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Self-propagating high-temperature synthesis

Six plenary and invited lectures presented at the 1st International Symposium on Self-propagating High-temperature Synthesis (SHS) held in Alma-Ata, Russia, on 23–28 September 1991 were published in the July 1992 issue of *PAC*.

The first paper, by Vadim V. Barzykin, is concerned with the initiation of SHS processes. Barzykin reviews the results of experimental and theoretical studies on combustion initiation in SHS systems reported in the literature and carried out by himself and his colleagues over the past 20 years. He considers different procedures for the initiation of the process in SHS systems such as radiant flux ignition, laser induction, ignition by combustion wave, spark and hypergolic ignition.

The other five Alma-Ata papers published in this issue of *PAC* are:

- Chemical classes of the SHS processes and materials (I. P. Borovinskaya);
- Structural macrokinetics of SHS processes (Alexander G. Merzhanov and Alexander S. Rogachev);
- Non-linear SHS phenomena: Experiment, theory, numerical modelling (B. V. Novozhilov);
- Macrokinetics of high-temperature heterogeneous reactions: SHS aspects (A. S. Shteinberg and V. A. Knyazik);
- Modifications of SHS processes (V. I. Yukhvid).

Crystalline structures of SHS products: Si_3N_4 (left) and TaN. From the paper `Chemical classes of the SHS processes and materials' by I. P. Borovinskaya published in the July 1992 issue of *PAC*.

Authors of all these papers are from the Institute of Structural Macrokinetics, Academy of Sciences of Russia, 142432 Chernogolovka, Moscow Region, Russia, with the exception of B. V. Novozhilov who is from the Institute of Chemical Physics, Academy of Sciences of Russia, 117334 Moscow, Russia.

Enzymes in organic synthesis

Enzymes play an important catalytic role in nature in the synthesis of a large number of complex organic compounds. They are also important in the pharmaceutical industry because they are cost-efficient, efficient and enzymatic syntheses are regio- and stereoselective. It is therefore not surprising that the number of research groups working in this field has increased from about 10 to over 200 in the last decade. Chemical and biochemical manufacturers are now able to supply an increasingly large number of enzymes for laboratory use in a stable immobilized form, as a whole cell preparation or as live organisms.

Almost 400 researchers from 31 countries attended the IUPAC sponsored International Symposium on Enzymes in Organic Synthesis which was held at the Holiday Inn, New Delhi, India, on 6–9 January 1992.

The scientific programme consisted of 8 plenary lectures, 20 invited lectures and contributed papers — mostly in the form of posters. Most of the plenary and invited lectures were published in the August 1992 issue of *PAC*. In addition, 48 oral and 79 poster presentations are being published in *Indian J. Chem.* **B** (1992).

All aspects of the topic 'enzymes in organic synthesis' were covered by the symposium. In particular, the meeting focused on the following topics:

- enzymes: structures; activity; mechanisms; and mimics;
- enantiometrically pure chiron synthesis with enzymes and micro-organisms;
- production of pharmaceuticals and other fine organic chemicals with enzymes and micro-organisms;
- catalytic antibodies;
- newer aspects of enzymes in organic synthesis.

Microbial oxidation of substituted aromatic compounds

Several IUPAC affiliates made significant contributions to the symposium. For example, affiliate Tomas Hudlicky and four colleagues from Virginia Tech, Blacksburg, USA, contributed a paper on 'Enzymatic hydroxylation of arene and symmetry considerations in efficient synthetic design of oxygenated natural products.' Their paper described the microbial oxidation of substituted aromatic compounds with mutant strains of *Pseudomonas putida* (39D) to yield the corresponding arene cis-diols in efficient quantities and greater than 99% enantiomeric excess.

Hudlicky and his team described the use of these synthons in the practical preparation of oxygenated natural products and emphasized the importance of symmetry considerations during synthetic planning in order to achieve enantiodivergent preparations of target compounds.

The authors highlighted applications by discussion of the syntheses of the following compounds from chlorobenzene: (+)- and (–)-erythrose, (+)- and (–)-ribonolactone, (+)- and (–)-trihydroxyheliotridane, (+)- and (–)-pinitol, kifunesine, lycoricidine and a model study for a short synthesis of (–)-morphine.

Synthesis of bioactive polyols

A team of 10 researchers from the Department of Chemistry, Wayne State University, Detroit, USA, co-authored a New Delhi paper on 'Applications of enzymes in the synthesis of bioactive polyols.' The main author was IUPAC affiliate Carl R. Johnson.

The team at Wayne State transformed cyclopentadiene, benzene and cycloheptatriene to functionalized meso-diols. They subjected the resulting meso-diols or their corresponding meso-diacetates to enzymatic asymmetrizations using enzymes, particularly lipases, in organic or aqueous media. Their paper reviewed examples of the use of the resulting aracemic products in the synthesis of a variety of polyols of biological interest.

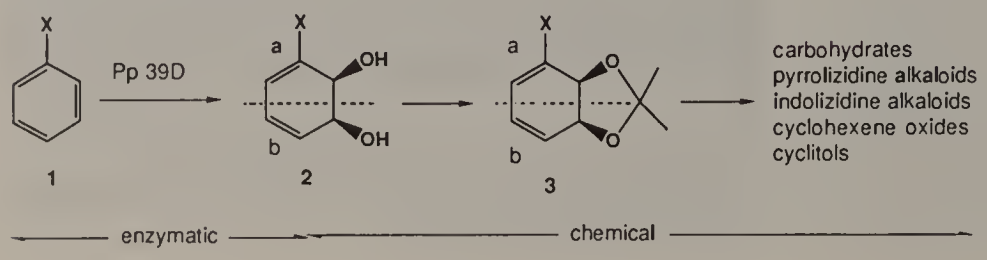
Lipase catalysed hydrolyses, esterifications and transesterifications

A paper by Karl Hult and IUPAC affiliate Torbjörn Norin from the Royal Institute of Technology, Stockholm, Sweden, was concerned with the 'Enantioselectivity of some lipases: Control and prediction.' Their paper presented different strategies for the resolution of racemates in lipase catalysed hydrolyses, esterifications, and transesterifications.

The Stockholm researchers emphasized the importance of the equilibrium conversion for the optimization of the enantiomeric excess. They carried out investigations on esters of 1-phenylethanol and 2-methylalkanoic acids. The results provided general information about important parameters for the enhancement of the enantiomeric excess and the reaction rates.

The paper also presented a 'matched strategy' stereochemical control for increasing the enantiomeric excess, that is, the use of a chiral acid for the resolution of chiral alcohols. Finally, the authors described the molecular modelling of lipase from *Rhizomucor miehei* as well as the use of a simple active site model of lipase from *Candida cylindracea* to obtain information for the prediction and modification of enzyme specificity.

IUPAC affiliate Virinder Singh Parmar and five co-workers from the Department of Chemistry, University of Delhi, India,



Biocatalysis approach to synthesis via arene oxidation by *Pseudomonas putida* 39D

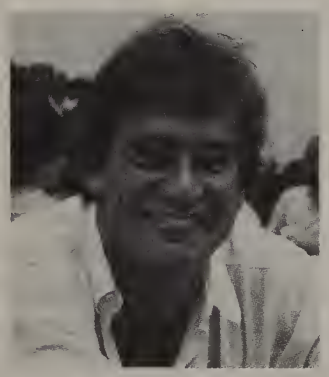
X = H, CH_3, Cl, Br, $CHCH_2$, CHO, OEt, CN, Ph.

contributed a paper on 'Potential applications of enzyme-mediated transesterifications in the synthesis of bioactive compounds.'

The Delhi team used the yeast lipase *Candida cylindracea* (CCL) and porcine pancreatic lipase (PPL) for regioselective deacylation of peracetylated benzopyrones, diphenyl-propenones and acetophenones for the first time. The deacylation study on different classes of polyphenols revealed that the presence of a carbonyl group attached to the aromatic ring is needed by the lipases to exhibit regioselectivity towards hydrolysis of acetoxyl groups. The acetoxyl groups at positions other than the one at the ortho position to the carbonyl group are selectively hydrolysed by PPL in organic solvents.

They also performed transesterification reactions using trifluoroethylbutyrate (TFEB), catalysed by PPL and CCL on some polyols in dry organic solvents. They found that the primary hydroxyl is acylated. In D-panthenol, the oxidized dextrorotatory form of which is a major constituent of vitamin-B complex, the primary hydroxyl group at the far end of the asymmetric carbon atom was exclusively acylated.

Parmar and his team consider that this work should be of importance in the synthesis of building blocks of biologically active natural products which may provide structural leads to anti-AIDS and anti-cancer agents.

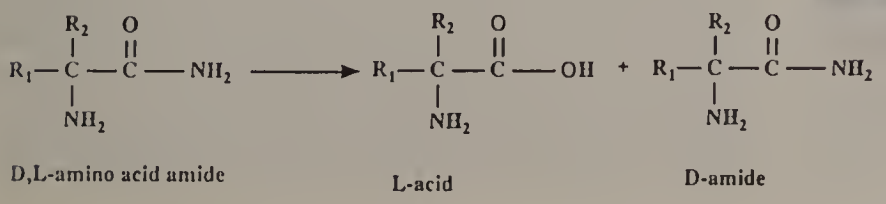


IUPAC affiliate Hans Schoemaker.

Synthesis of amino acids and derivatives

Eight researchers from the Bio-organic Chemistry Section, DSM Research, Geleen, The Netherlands presented a paper on 'Chemo-enzymatic synthesis of amino acids and derivatives' at the New Delhi symposium. IUPAC affiliate Hans Schoemaker was the main author of the paper. He is leader of this section at DSM.

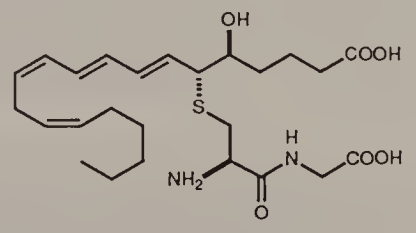
In the introduction to this paper, the authors point out that amino acids and derivatives are becoming increasingly important as intermediates for pharmaceuticals and agrochemicals. Well-known examples include D-phenylglycine and D-*p*-hydroxy-phenylglycine as building blocks for the antibiotics Ampicillin and Amoxycillin respectively and L-phenylalanine for the dipeptide sweetener Aspartame. More recently, L-homophenylalanine and derivatives have been used for the synthesis of ACE-inhibitors, L-valine as a precursor for the immuno-depressant Cyclosporin A and D-valine in the production of Fluvalinate, a pyrethroid insecticide.



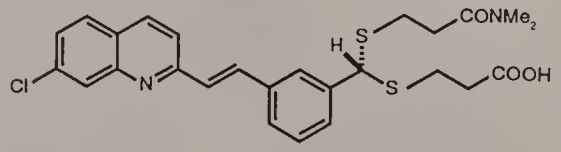
At DSM a generally applicable resolution process based on the enzymatic hydrolysis of amino acid amides with an aminopeptidase from *Pseudomonas putida* has been developed. The principle step of the process is depicted above (R_2 = H). Also visualized in this scheme is the resolution of α-disubstituted amino acids (R_2 = alkyl) with the aid of an L-amidase preparation from *Mycobacterium neoaurum*. Both processes have been extensively reviewed according to Schoemaker.

Recent developments include new approaches towards the synthesis of the starting materials of the enzymic resolution (α-H and α-alkylsubstituted amino acid amides), enzyme purification and the development of other aminopeptidase or amidase preparations with different substrate and/or stereoselectivities. The paper discussed some of these developments and presented some applications of the amino acid derivatives. Finally, the team considered, in their paper, the enzymatic resolution of α-H and α-alkyl substituted hydroxy-acids.

IUPAC affiliate Ichiro Shinkai and colleague Mahadevan Bhupathy (Merck Sharp & Dohme Research Laboratories, New Jersey, USA) contributed a paper on 'Chemoenzymatic synthesis of a novel LTD_4 antagonist.' They described an efficient four-step synthesis of the novel receptor antagonist (MK-0679) of leukotriene D_4 (LTD_4).



Leukotriene D_4



MK-0679

The key steps are the enzymatic hydrolysis of prochiral diester to the ester-acid in 98% enantiomeric excess followed by aluminium mediated amidation of the methyl ester which affords MK-0679 in high overall yield.

Production of pharmaceuticals and other fine organic chemicals with enzymes and micro-organisms was one of the topics of the New Delhi symposium. (*Photo Roche.*)

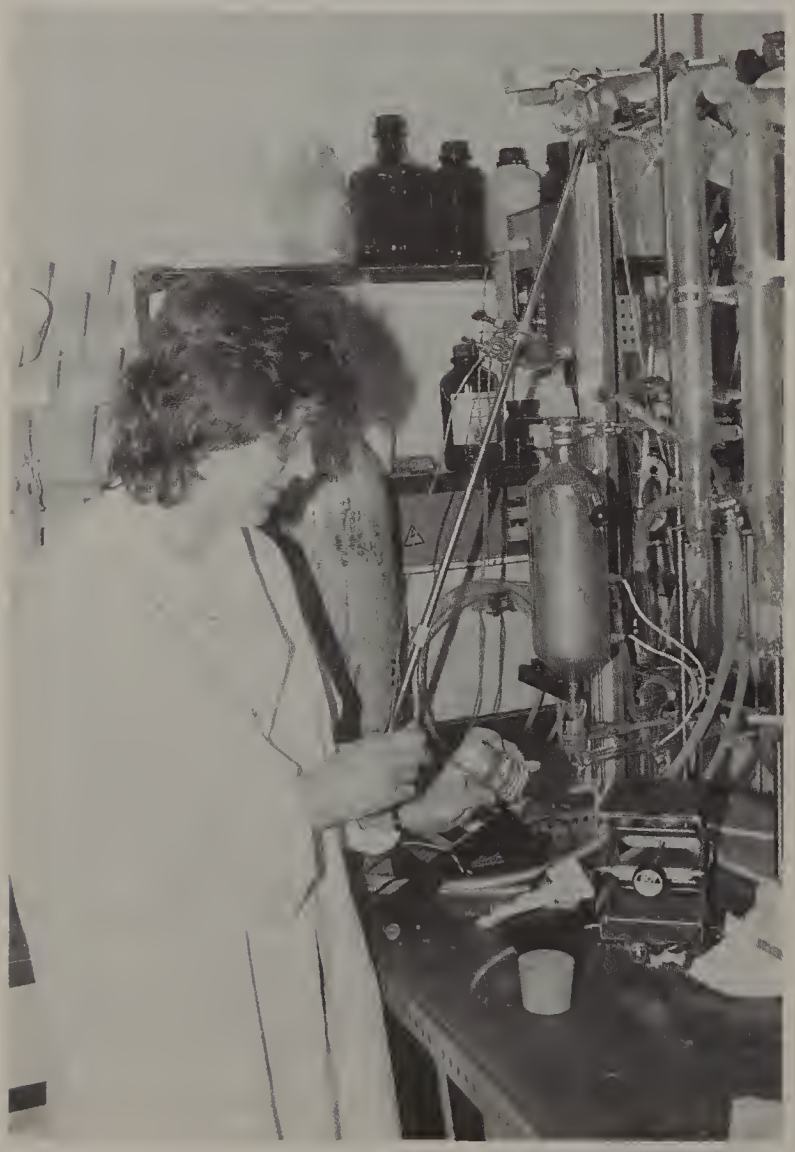
Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Guidelines for the publication of research in experimental organic chemistry (Technical Report)

Guidelines for the description of experimental procedures, for the characterization of compounds, and for presentation of derived physico-chemical quantities and mechanistic interpretation are formulated. These guidelines are recommended as a minimum set for the publication of research in experimental organic chemistry.

This report was prepared for publication by W. Drenth, Working Party on Standards for Presentation of Data, Commission on Physical Organic Chemistry, Organic Chemistry Division, and published in Pure Appl. Chem. ***64****, 989–990 (1992)*



The July issue of *Pure and Applied Chemistry* contains guidelines for the publication of research in experimental organic chemistry.

Nuclear activation techniques for the determination of trace elements in atmospheric aerosols, particulates and sludge samples (Technical Report)

Activation analysis is one of the major techniques for the determination of many minor and trace elements in a large variety of solid environmental and pollution samples, such as atmosphere aerosols, particulate emissions, fly ash, coal, incineration ash and sewage sludge, etc. Neutron activation analysis of total, inhalable or respirable airborne particulate matter collected on a filter or in a cascade impactor on some substrate, is very popular. By Instrumental Neutron Activation Analysis (INAA) up to 45 elements can be determined. The irradiation and counting procedures can be adapted to optimize the sensitivity for particular elements.

The precision is largely governed by counting statistics and a high accuracy can be obtained after calibration with multi-elemental standards. Radiochemical Neutron Activation Analysis (RNAA) is applied only when extremely low limits of determination are required. Instrumental Photon Activation Analysis (IPAA) is complementary to INAA, since some elements of environmental interest can be determined which do not produce appropriate radionuclides by neutron irradiation. Charged Particle Activation Analysis (CPAA) is used in particular circumstances such as for certification purposes or coupled to radiochemical separations for extremely low concentrations.

This report was prepared for publication by R. Dams, Commission on Microchemical Techniques and Trace Analysis, Analytical Chemistry Division, and published in Pure Appl. Chem. ***64****, 991–1014 (1992)*

Reactant adsorption in analytical pulse volammetry: methodology and recommendations (Technical Report)

This report surveys the effects that arise in pulse voltammetric analysis if the reactant is adsorbed at the electrode–solution interface. Modifications of normal and differential pulse polarograms are outlined. Suitable methodology is developed on the basis of available theory and experimental evidence. The report is concluded with guidelines for detecting reactant adsorption as well as recommendations for properly dealing with them in practical analytical situations.

This report was prepared for publication by Herman P. van Leeuwen, Jacques Buffle and Milivoj Lovric. Commission on Electroanalytical Chemistry, Analytical Chemistry Division, and published in Pure Appl. Chem. ***64****, 1015–1028 (1992).*

Ochratoxin A: a review (Technical Report)

Ochratoxin A is a mycotoxin of current interest from a public health point of view; consequently, a considerable effort has been and is being expended to document human and animal exposure to this mycotoxin and the consequences of such exposure. This paper reviews the current status of knowledge with respect to ochratoxin A.

This report was prepared for publication by A. E. Pohland, S. Nesheim and L. Friedman, Commission on Food Chemistry, Applied Chemistry Division, and published in Pure Appl. Chem. ***64****, 1029–1046 (1992)*

Selection of terms, symbols and units related to microbial processes (IUPAC Recommendations 1992)

The present List of the Selected Terms, Symbols and Units Related to Microbial Processes differs from the one recommended earlier (*Pure Appl. Chem*. **54**, 1743–49, 1982) by some clarifications and additions. These are due to the developed knowledge and, correspondingly, new quantities formulated which describe particular characteristics of growth and product formation, specifically, integral energy characteristics.

Substantial difference of the present List also lies in the fact that the nomenclature of characteristics and processes connected with microbial growth has been brought to maximal accordance with the newly established IUPAC recommendations mostly contained in *Quantities, Units and Symbols in Physical Chemistry*. Blackwell Scientific Publications, I. Mills, T. Cvitas, K. Homann, N. Kallay and K. Kuchitsu Oxford, (1988).

Ambiguity of a term leads to misinterpretation, it can complicate mutual understanding between scientists. Therefore, in describing particular terms, both existing and new, short explanations are given when deemed necessary.

This report was prepared for publication by V. K. Eroshin, Commission on Biotechnology, Applied Chemistry Division, and published in Pure Appl. Chem. ***64****, 1047–1053 (1992).*

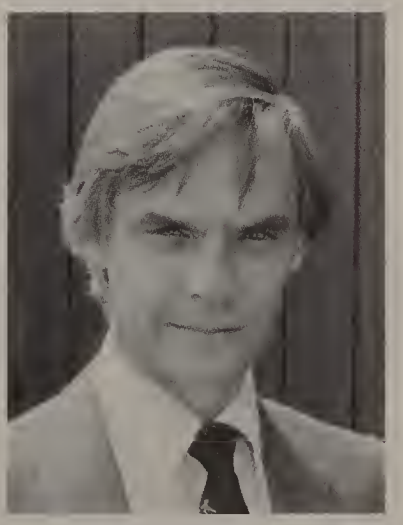
A synopsis of the report was published as Provisional Recommendations in Chem. Intl. ***11****, 239 (1990). The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of June 1990 were taken into consideration when preparing the final report.*

Cooperation between IUPAC and WHO

IUPAC is a non-governmental organization in official relationship with WHO. At the 45th World Health Assembly held in Geneva in May, Howard Worth, IUPAC's official liaison representative to WHO, presented a statement on cooperation between IUPAC and WHO. The statement, which is reproduced below, referred in particular to the International Programme on Chemical Safety. The statement is preceded by a brief description by Worth of links between IUPAC and WHO.

The interests of IUPAC and World Health Organization (WHO) overlap sufficiently for IUPAC to take up the option, a few years ago, to appoint a Liaison Officer to WHO. This gives IUPAC the standing of a non-governmental organization (NGO) and allows its nominated representative to attend the Executive Board Meetings of WHO and the Annual World Health Assembly. This in turn gives the Liaison Officer the right to participate in technical discussions held as part of the World Health Assembly and also to make statements concerning the review of WHOs business presented at plenary or open committee sessions at the Assembly.

The business of WHO is conducted in a very formal fashion in keeping with the procedures of all United Nations organizations. Executive Board and General Assembly meetings are attended by delegates from each member country, of which there are nearly 200, representatives of the NGOs whose number is as great and representatives of recognised and invited non-member states, and representatives of the United Nations and related organizations, which include World Bank, Organization of African Unity, Commission of the European Communities, etc. It is the right of the delegates



Howard Worth (King's Mill Hospital, Sutton-in-Ashfield, Nottinghamshire, UK) is a member of the IUPAC Clinical Chemistry Division Committee and is the Union's official liaison representative to WHO during mid-1991 to mid-1993.

of every member state, and the other organizations by prior arrangement, to make comment or statements on each agenda item. This can make time-tabling difficult particularly when topical items such as the global strategy for the prevention and control of AIDS are under discussion and where almost every national delegate wishes to contribute to the discussion.

The Executive Committee meets twice a year in January and May and is appointed through the Regional Offices of WHO. It has the responsibility to determine policy and establish programmes which will implement that policy. The World Health Assembly, which is held in May, is like a company's Annual General Meeting in that it consists of a series of progress reports. It is the means by which WHO is held accountable for the way in which it has carried out its business.

The Assembly lasts 2 weeks and is divided into three main sections, plenary sessions, Committee A and Committee B. The plenary sessions begin by electing chairmen and officers for Committees A and B and then receive the main annual reports from the Director General, the Executive Board, etc. Committee A is concerned primarily with the scientific work of WHO and Committee B with its financial and organizational procedures, although some scientific matters are also referred to Committee B. Both the Executive Board meetings and the World Health Assembly are held in Geneva, the Executive Board at WHO headquarters. However, the number of attendees to the World Health Assembly, and the need to be able to hold three major sessions simultaneously, means that it cannot be accommodated at WHO headquarters and the United Nations, Palais de Nations is used.

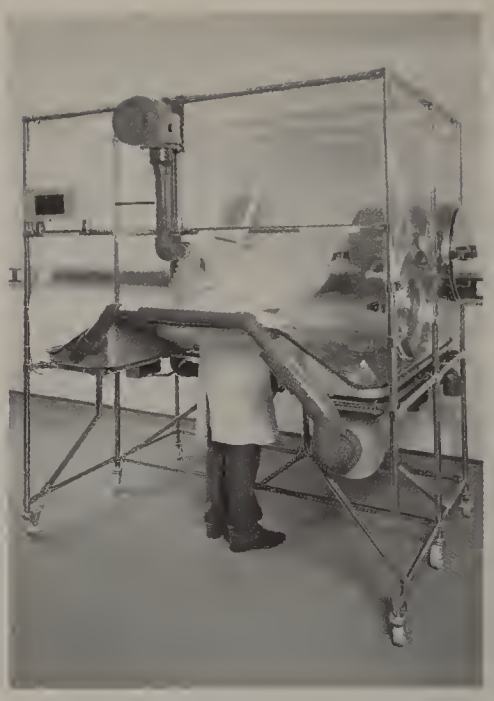
The 45th World Health Assembly was held on 4–15 May 1992 and included within its agenda, a report on the work of the International Programme on Chemical Safety. This programme was established in 1980 as part of the Division of Health and Environment and was a joint venture between WHO, United Nations Environment Programme and the International Labour Office. It has now been established as a Division within its own right in WHO. The work of IPCS overlaps with a number of the interests of IUPAC and indeed there has been collaboration over several years, particularly between IPCS and the Toxicology Commission (VII.1). For this reason IUPAC thought it appropriate to make a statement in support of the work of IPCS presented in its report at the General Assembly, and also to take the opportunity of mentioning other areas where there is common interest and has been collaboration.

The prepared statement presented by the IUPAC/WHO Liaison Officer to the World Health Assembly Committee A is reproduced below.

The Statement

I have the honour and privilege to address this meeting on behalf of the International Union of Pure and Applied Chemistry (IUPAC) as a non-governmental organization in official relation with WHO. In doing so I would like to congratulate the Director General of WHO on the activities and important work carried out by the International Programme on Chemical Safety (IPCS). I am pleased to have this opportunity to express the support of IUPAC in this important work, and to present areas where the Union is working in similar programmes and some areas where this is already being done in direct collaboration with IPCS.

IUPAC in collaboration with IPCS is producing a monograph on the safe handling and disposal of chemicals, which is now in its final stages and will be published by Cambridge University Press during 1992. Perhaps the most important



Safe handling and disposal of chemicals: IUPAC is preparing a monograph in collaboration with IPCS.
(*Photo MDH Ltd.*)

collaboration at the present time is in the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. Clearly IPCS has an important input into this programme. Professor V. A. Koptyug (Russia) Past President of IUPAC and Chief Coordinator of the Union's mission-orientated Chemistry and the Environment Programme, is a member of the Preparatory Committees for UNCED. The CHEMRAWN (Chemical Research Applied to World Needs) programme of IUPAC devoted its seventh conference — CHEMRAWN VII — to a World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change at Baltimore in December 1991. CHEMRAWN VIII will be held at Moscow in September 1992 as a follow-up to the UNCED. In September 1990 IUPAC held its first Workshop on Safety in Chemical Production at Basle. The proceedings have now been published and will be followed by other similar workshops throughout the world.

I would like to take this opportunity to draw the attention of the Assembly to work carried out by Commissions of the Union, which I believe will be of interest to the WHO. The Toxicology Commission of the Clinical Chemistry Division has produced a glossary of terms used in toxicology, and I am pleased to be able to say that this has been done in consultation with IPCS. The Commission on Quantities and Units in the same Division is producing a compendium on terminology and nomenclature in clinical chemistry. The Commission on Environmental Analytical Chemistry has begun publishing a series of monographs on Environmental Analytical and Physical Chemistry, the first volume of which, *Environmental Particles*, has been published recently, and the Commission on Atmospheric Chemistry in the Applied Chemistry Division has issued a glossary of atmospheric chemistry terms.

The International Union of Pure and Applied Chemistry has worked in collaboration with other sections of WHO, particularly Laboratory Technology and Blood Safety. Currently members of IUPAC are involved in the publication of a WHO document on the Maintenance and Repair of Laboratory and Hospital Equipment.

In conclusion, the International Scientific Union which I represent is proud to have an official relationship with WHO as a non-governmental organization. It hopes to continue the collaboration with WHO and that new areas of collaboration will be achieved in the future.

Sulphur cycling

The recently published SCOPE 48 report is entitled 'Sulphur Cycling on the Continents: Wetlands, Terrestrial Ecosystems and Associated Water Bodies.'

Introduction

The Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) launched a major series of projects on biogeochemical cycles in 1974. Initially these projects focused on the study of the cycles of carbon, nitrogen, sulphur, and phosphorus separately. It was, however, understood from the beginning that none of these cycles operates independently from the others and that attempts would be made to include studies of elemental interactions in each unit's activities.

Much of the work on individual cycles has been coordinated by the SCOPE/UNEP (United Nations Environment Programme) international units working separately: carbon, under the direction of the late Professor Egon Degens in Hamburg, Germany; nitrogen, under the direction of Professor Thomas Rosswall in Uppsala, Sweden; sulphur, under the direction of Academician Mikhial Ivanov in Moscow, USSR; and phosphorus under the direction of Dr C. Vernon Cole in Fort Collins, USA. SCOPE also has sponsored efforts to have groups of scientists unravel many of the mechanisms of mutual interactions (SCOPE 17, edited by G. E. Likens, 1981, and SCOPE 21, edited by B. Bolin and R. B. Cook, 1983). Also various international units have met jointly to explore specific interactions between two element cycles, as between carbon and sulphur (SCOPE 42, edited by Degens *et al*., 1991, *Biogeochemistry of Major World Rivers*).

International Sulphur Unit

The SCOPE/UNEP International Sulphur Unit's first investigation, *The Global Biogeochemical Sulphur Cycle* (SCOPE 19, edited by Ivanov and Freney, 1983), brought together information on sulphur in all aspects of the globe and attempted to construct a simulation model of the modern sulphur cycle. Since many of the processes of global sulphur fluxes were not adequately related to their controls, the focus of the book was on areas where knowledge of processes and effects (actual or potential) of anthropogenic inputs of sulphur on the environment were poorly understood.

The second phase of the SCOPE/UNEP International Sulphur Unit, started in 1982 and continuing until 1986, had two important tasks. The first was to examine the information on the global cycle and its perturbations that could be obtained from the sulphur isotopic composition of various reservoirs, fluxes and ecosystems. This material has been published as SCOPE 43, 1991, edited by H. R. Krouse and V. A. Grinenko, entitled *Stable Isotopes: Natural and Anthropogenic Sulphur in the Environment*. The second activity was a meeting in Tallinn, Estonia, which drew together information on the evolution of the sulphur cycle, allowing the current anthropogenic perturbations to be placed in a context related to past changes over geological time. This material was published in 1989 as SCOPE 39, edited by P. Brimblecombe and A. Yu. Lein, entitled *Evolution of the Global Biogeochemical Sulphur Cycle*.

Bog in the west coast of Ireland. Saline and/or brackish wetlands comprise approximately 9% of the total global wetland area, while freshwater wetlands occupy the remaining area. Wetland ecosystems, whether salt marshes, brackish water marshes, freshwater bogs, fens, marshes or swamps, are all characterized as having soils that are frequently or continuously waterlogged and that are often high in organic matter content.

The third and final phase of the activities of the SCOPE/UNEP International Sulphur Unit was started in 1986 and focused on the cycling of sulphur in continental ecosystems. Continental was interpreted as including soils, wetlands, inland lakes, rivers, and estuaries. Sulphur cycling in oceans was dealt with in part in SCOPE 39.

Three meetings were held as part of this third phase. Two of these were in conjunction with the SCOPE/UNEP International Carbon Unit. The first, a joint workshop to deal with interactions in estuaries, was held at Texel in the Netherlands in September, 1987. The second, also a joint meeting between the International Carbon and Sulphur Units, entitled, The Biogeochemical Carbon and Sulphur Cycles in Lakes and Water Bodies, was held at Irktusk, Lake Baikal, in September 1988. The main objective of this workshop was a discussion and synthesis of the existing information on biogeochemical processes and fluxes of elements in lakes and water bodies of different types. Attempts were made to discuss the evaluation of existing methods for investigation and modelling of freshwater aquatic ecosystems. The information accumulated from the first two workshops was synthesized and published as *Interactions of Biogeochemical Cycles and Ecosystems*, edited by E. T. Degens, S. Dempe, A. Lein, and Y. Sorokin, University of Hamburg Press.

The third UNEP/SCOPE workshop in this series was held at Trent University, Peterborough, Canada in May 1989. This workshop was designed so that in addition to an overview of atmospheric sulphur and biogenic fluxes of sulphur to the atmosphere, the major focus would be on sulphur cycling processes and fluxes in natural and cultivated wetlands, forest and agroecosystems. The outcome of this third meeting is SCOPE 48. It includes some material from the earlier meetings at Texel and Lake Baikal.

SCOPE 48

Sulphur Cycling on the Continents: Wetlands, Terrestrial Ecosystems, and Associated Water Bodies (SCOPE 48) reviews and synthesizes information on the processes that govern the cycling of sulphur in the various ecosystems of the continents. Whenever possible, chapters have synthesized information both on rates of sulphur-cycle processes and on the controls of these processes. An understanding of these processes and their controls is essential to determine accurately the effect of anthropogenic sulphur deposition on ecosystem structure and function to predict the role of altered sulphur cycling in global change.

Current evidence indicates that biogenic sources of sulphur to the atmosphere, with the exception of marine sources of DMS (dimethylsulphide), are much smaller than once thought, and so anthropogenic sources of atmospheric sulphur dominate (Chapter 2 by Whelpdale and Chapter 3 by Andreae and Jaeschke). These anthropogenic sulphur emissions have started to decrease in North America and Europe and are predicted to continue to decrease, but large increases in Asia, Africa, and South America seem likely. A knowledge of sulphur cycling at the scale of the ecosystem is required to evaluate the recovery of areas already polluted by acid deposition (SCOPE 19) and the potential impact of further sulphur deposition and acidification in tropical countries (SCOPE 36).

Detailed and relatively accurate information on sulphur processes is generally now available for a variety of specific sites in a variety of types of ecosystems. However, measurements are usually made at a fine areal scale (a few square metres), and a challenge exists in developing the ability to integrate these to regions, to continents, and to global basis

An understanding of the processes that govern the cycling of sulphur in the various ecosystems of the continents and their controls is essential to determine accurately the effect of anthropogenic sulphur deposition on ecosystem structure and function and to predict the role of altered sulphur cycling in global change.

(SCOPE 35). One approach may be to synthesize process information into credible mathematical simulation models that accurately mimic the behaviour of sulphur and natural ecosystems.

Obviously we have much to do before we can achieve these aims, despite the large amount of study over the past two decades of sulphur and nutrient cycling, element interactions, acid deposition, and climate change. Nonetheless, remarkable progress in understanding has been made, and we believe the synthesis in this book of the existing material from workers using different techniques and approaches will be extremely useful. We found that bringing this material together exposed many gaps in information, unevenness in progress, and sometimes lack of communication between groups looking at the same problem from different angles or in different ecosystems. Thus much was gained from bringing groups together and discussing common problems at the Trent workshop. We hope that the readers of this book will profit from this synthesis.

Sulphur and sulphur compounds are not easy to determine analytically. (*Photo courtesy ISC Chemicals Ltd.*)

Analytical challenge of sulphur

Sulphur and sulphur compounds are not easy to determine analytically. Thus, from the onset of work on sulphur in soils and sediments, there has been much discussion and debate on analytical methodology. Despite progress in this area (Appendix by Tabatabai), further method development is needed for many questions, such as measuring the diurnal fluctuation of sulphur in the vicinity of a plant root under aerobic or anaerobic conditions, or accurately estimating fluxes of sulphur gases from point sources to the atmosphere. Similarly, the complexity of the interactions that occur in the decomposition of plant material in soils and sediments has not allowed us to determine the chemical nature of much of the sulphur that is held in organic material. Indeed, most methods of studying sulphur transformations rely heavily on isotopic methods to gain estimates of the fluxes of sulphur in such systems and do not attempt to measure the exact quantities of chemical compounds. These methods themselves are complicated, especially with regard to isotopic exchange among pools and the discrimination that occurs in reduction and oxidation processes between the heavier and lighter isotopes of sulphur. However, an understanding of the discrimination processes has allowed this particular technique to advance our knowledge of anthropogenic fluxes of sulphur in the environment (SCOPE 43; Appendix to Chapter 3 by Nriagu and Krause, this volume).

The analytical challenge of sulphur has been further complicated by the number of additional sulphides that have been discovered in the atmosphere during the last 15 years, such as dimethylsulphide, carbonyl sulphide and carbon disulphide. Thus, as our knowledge expands on the existence of natural sources of atmospheric sulphur compounds to the atmosphere, we require much more information on the processes of formation and decomposition that occur, both in the atmosphere and in terrestrial systems (Chapter 3). Andreae and Jaeschke (Chapter 3) summarize the most important naturally emitted sulphur compounds known at the time of writing and present best estimates of these fluxes. They emphasize three uncertainties regarding continental emissions of biogenic sulphur compounds. First, there is the difficulty of being able to determine these at low levels. Second, there are technical problems of either measuring point sources or estimating these across regions. Third, knowledge of the exact processes involved is incomplete, as are all the controls on these processes. Understanding these controls is complicated by the great diversity of interactions of the sulphur cycle with other element cycles (Chapter 4).

Despite problems and complications, substantial progress has been made during the past two decades, especially through intensive studies to understand the effects of anthropogenic deposition on lakes, wetland ecosystems, and upland forests. These studies have emphasized the critical role that sulphur plays in the biogeochemistry of these ecosystems.

Much progress has been made in our knowledge of sulphur cycling in marine and freshwater wetlands (Chapter 5 by Giblin and Wieder). In marine wetlands, the tidal fluxes of sulphur are very large in comparison to the rates of sulphur processing within the sediment, and rapid cycling occurs primarily through inorganic reduced forms of sulphur. Sulphate reduction is the dominant form of decomposition in these systems. Gaseous fluxes are high in comparison to any other ecosystems, but represent only a tiny fraction of a cycle within the wetlands. Also, because of the relatively limited area of these marine wetlands, their influence on the global atmospheric sulphur cycle is limited.

The freshwater wetlands have a much lower sulphur input and the cycling of organic sulphur is much more important. One study, which examined the effect of increased sulphur deposition on a freshwater peatland, suggested that it may increase rates of anoxic decomposition and thereby decrease storage of organic carbon in the peat (See Appendix to Chapter 5 by Wieder *et al.*). Increased inputs of sulphur to a wetland also clearly reduce the fluxes of ethane from the wetland to the atmosphere. The chemistry of sulphur in wetland systems is complicated due to the wide range of oxidation states of sulphur, –2 to +6, the wide variety of both organic and inorganic sulphur compounds found, and the methodological problems already mentioned. Chapter 6 by

Luther and Church integrates information on the chemistry of sulphur (emphasizing marine wetlands) and suggests major transfers among inorganic and organic species in natural ecosystems.

The research of the past two decades on sulphur cycling in lakes and other inland water bodies has been similarly encouraging. Freshwater lakes are among the ecosystems most obviously damaged by acid deposition. Research has clearly noted the resulting changes that occur in the sulphur cycle, the attendant changes in acid–base chemistry of lakes, the alteration of interactions with carbon, nitrogen, phosphorus, and other major elements, and the ability of the lakes to partially counteract acidification. Cook and Kelly (Chapter 7) point to the key features in freshwater lakes as being assimilatory reduction and uptake of sulphate in the water column by algae and bacteria, dissimilatory sulphate reduction by bacteria in anoxic zones, reaction of reduced S species with organic matter and reduced metals, and the production of sulphur gases likely to accompany decomposition of sulphur-bearing organic matter.

In Chapter 8, Lein and Ivanov explore another form of alteration of the sulphur cycle in aquatic ecosystems: the intensification of sulphate reduction which accompanies eutrophication in continental and coastal seas. The processes which occur are the same as in the freshwater lakes subject to acidification, but the magnitude and consequences of the processes differ. As with marine wetlands, sulphate reduction dominates the decomposition which occurs in the sediments of seas. Increased inputs of nutrients and organic carbon to these seas increase the rates of sulphate reduction, with a concomitant increase of hydrogen sulphide in the waters and rise in the depth of the anoxic–oxic boundary.

Chapter 9 by Mitchell *et al*. deals with sulphur dynamics in forest ecosystems and summarizes much of the information gained from studying the impacts of acid-sulphate deposition on forest vegetation and soils. The role that sulphur retention or release plays in affecting the flux of acidity to downstream ecosystems is now clear, as is the interaction of sulphur with other elemental cycles, especially nitrogen and basic cations. However, Chapter 9 notes that there are still inconsistencies in the measurement of dry and cloud-water deposition, and that there are still major unanswered questions with regard to sulphur retention and adsorption in soil. For example, the effect of sulphur storage in organic compounds has to be understood in terms of release rates over a longer period: is this organic sulphur held in a recalcitrant organic matter pool or can it be released quickly? The fluxes of sulphur gases from forests also remain poorly studies, particularly for tropical forests and for fluxes directly from forest vegetation.

Significant progress also has been made in understanding sulphur cycling in upland agricultural systems (Chapter 10 by Schoenau and Germida). We now have a basic understanding of the forms and amounts of sulphur in agricultural soils and of the processes controlling the supply of sulphur to plants. Again, the exchange of sulphur gases between the soil and plant system and the atmosphere is less well understood, as is the immediate and long-term effect of sulphur loading from the atmosphere. The authors of Chapter 10 suggest we still need a better understanding of the basic forms of sulphur in the soil, and of transformations through chemical and biological reactions. An emphasis is also needed in extrapolation from square metre to field and to region, and a requirement for more emphasis on the construction of models of mineralization and volatilization processes that include information on controls such as temperature, moisture, substrate and microbial composition response functions.

Managed lowland systems, specifically wetlands used in rice culture, offer many opportunities for expansion of knowledge. In many rice-paddy soils, high yield agriculture has stressed natural reserves of soil sulphur to an extent where sulphur deficiency is becoming a common occurrence (Chapter 11 by Lefroy *et al*.). Partially for this reason, research has concentrated on the supply of sulphur to plants and on the efficiency of fertilizer use, and much of the work reviewed in Chapter 11 concentrates on the efficiency of recovery by plants of applied fertilizer sulphur. In comparison with the other ecosystems discussed in this book, much less information is available on the processes of sulphur cycling within rice paddies.

The focus of research on use of fertilizer sulphur provides practical short-term solutions to sulphur limitations, but it may not deal adequately with the long-term supply of this essential element. Also left relatively under-studied are the potential toxic effects of sulphur on rice and the effect of sulphur cycling on methane fluxes from rice paddies. We suggest that there should be a major effort towards research on sulphur processes and their controls in rice-paddy eco-

Farmers harvesting rice in the north-eastern Himalayas, Bhutan. The potential toxic effects of sulphur on rice are relatively under-studied. (*WFP photo by F. Mattick.*)

systems, as there has been in other types of ecosystems, including managed upland agricultural systems. Such an emphasis on understanding sulphur cycling is especially needed as there has been a recent trend to re-examine organic amendments or incorporation of legumes in sustainable rice cultivation, a type of green manuring. This will require a better understanding of the dynamics of sulphur, nitrogen, and carbon in these systems.

In our discussions at Trent, the synergism between those working on natural wetlands and cultivated wetlands gave rise to hopes that some of the methods recently developed in natural wetland studies could have application in cultivated wetland studies. Similarly, the managed nature of the rice wetlands provided the opportunity for understanding processes under more controlled conditions that could clarify the same processes occurring under natural conditions. This was a most encouraging aspect of the Trent workshop.

Conclusion

Finally, we conclude by noting that society has greatly altered sulphur cycles in a variety of ways, but the full magnitude of these is still unknown. Acid sulphur deposition has damaged forests and lakes, and the challenge has been accepted in industrialized temperate regions to begin to ameliorate the problem and restore damaged areas. Tropical areas are also known to be vulnerable to a greater or lesser extent, but questions arise as to our ability to control the magnitude of anthropogenic sulphur inputs to these systems and to limit their deleterious effects.

Eutrophication of continental and coastal seas has increased the abundance of sulphides in the water column, to the detriment of life in these water bodies. And by developing high yield agriculture, we have stressed natural systems of sulphur supply and developed a need to add fertilizer sulphur in a manner that supplies plant needs without altering important soil quality characteristics and properties.

Atmospheric sulphur comes principally from anthropogenic sources, and biogenic fluxes of sulphur from terrestrial ecosystems are thought to be relatively small. However, we do not have the capability to predict how they will change in response to added inputs of sulphur or other human influences. The major biogenic source of atmospheric sulphur appears to be oceanic DMS, but the exact magnitude of this flux and its control remain poorly known. We are unable at present to predict how this flux may change in response to climatic change or changing nutrient inputs to the oceans.

[The above review is composed of the Introduction (in part) and the complete Summary and Conclusions of SCOPE 48. These extracts, written by SCOPE President J. W. B. Stewart (University of Saskatchewan, Saskatoon, Canada) and R. W. Howarth (Cornell University, Ithaca NY, USA) are reproduced here with the kind permission of SCOPE.]

SCOPE Report 48: Sulphur Cycling on the Continents: Wetlands, Terrestrial Ecosystems, and Associated Water Bodies*, edited R. W. Howarth, J. W. B. Stewart and M. V. Ivanov is published by John Wiley & Sons, Chichester, UK, 1992. xxi + 350 pp. ISBN 0 471 931535. Price GBP 75.00/ USD 159.60.*

Solvents and the environment

Solvents contribute to many different environmental problems, including some of the most serious we face today. However, scope for improvement in industrial practice is great.

A recent edition of *Industry and Environment* (see box, over) looks at industrial solvents, a subject to which UNEP/IEO, within the context of its Cleaner Production Programme, attaches special importance. A wide range of organic and inorganic solvents are in use right across the industrial spectrum, as cleaners, reactants during product manufacture or in formulated products.

This diverse group of chemicals contributes to many different environmental problems, including some of the most serious we face today. On the other hand, the scope for improvement in industrial practice is great. Opportunities — both technical and economic — abound for companies to move to less polluting production methods and for governments to support and speed up the process.

Throughout their history, industrial solvents have caused concern because of their human health or environmental impacts. In many countries, the resulting legislation has played an important role in guiding the development of work practices and of new solvents.

The flammability of some early solvents led to their widespread replacement with less explosive types nearly a century ago. Industry turned largely to chlorinated solvents, but many of these are toxic to humans. Regulations to minimize exposure were introduced in many countries, and some industries developed less toxic alternatives.

In the last two decades, however, attention has shifted from health to broader environmental issues. One of the earliest environmental concerns was water pollution, particularly by chlorinated solvents. This is still an important area of concern today. Most chlorinated hydrocarbons are toxic, persistent, and difficult to remove from water supplies once contamination has been caused. And in industrialized countries contamination of groundwaters is already widespread. One survey of 1000 drinking water wells in the United States detected methyl chloroform in 78%, chloroform and carbon tetrachloride in 64%, 1,1,2-trichloroethylene in 58%, and transdichloroethylene in 51%.

Industry and environment

This article on 'Solvents and the environment' is reprinted from *Industry and Environment* (Vol. 14, No. 4, 1991) — a publication of the Industry and Environment Office of the United Nations Environment Programme (UNEP/IEO). The issue contains 12 other articles on the same topic:

- Introduction to solvents: some facts and figures (K. Palmer, J. Passe and E. Hartzell).
- Progress toward phasing out the use of CFC-113 and 1,1,1-trichloroethane in solvent applications (Stephen O. Andersen).
- The UNEP Cleaner Production working group on halogenated solvents (Aage S. Hillersborg).
- UNEP and ICOLP co-operate to strengthen the OzonAction Information Clearinghouse.
- Solvent cleaning in the Asian electronics industry: The search for alternatives to CFC-113 and methyl chloroform (1,1,1-trichloroethane) (David C. O'Connor).
- Malaysian CFC solvent reduction strategies (X'avier Hin Kong Yoong).
- The Ford Arbor Plant (Brazil) CFCs elimination programme (Milton Edson Lubraico).
- Halogenated solvents: their role in cleaning (C. Hampson).
- Elminating organic solvents use through the substitution process (Gitte Goldschmidt and Henry Larsen).
- Reduction of volatile organic compounds use in the production of flexible packaging (Paul W. Verspoor).
- Réduction des consommations de solvants chlorés: 70 tonnes par an. Moulinex — un cas à valeur d'exemple (R. Dorgueille).
- Chlorinated solvents: time for a global ban (Beverley Thorpe).

On 31 May 1991 the UNEP Governing Council decided to give IEO a greater degree of autonomy by establising a programme activity centre. Accordingly, in 1992, IEO became the Industry and Environment Programme Activity Centre (IE/PAC).

For further information on IE/PAC and its publications please contact: Industry and Environment Programme Activity Centre (IE/PAC), Tour Mirabeau, 39/43 Quai André-Citröen, 75739 Paris Cedex 15, France. Tel. +33 (1) 4058 8850. Fax +33 (1) 4058 8874. Telex 204997.

A few chlorinated solvents contribute to an even more important environmental issue — the depletion of the stratospheric ozone layer — and are urgently being phased out world-wide.

A much broader range of solvents contributes to another very serious environmental problem — photochemical pollution in the troposphere (or lower atmosphere). Many modern solvents are volatile organic compounds (VOCs) which react with sunlight and other compounds naturally present in air to form a variety of secondary pollutants, including ozone. One result of photochemical pollution is smog, but low-level ozone pollution is an even more important problem. It is toxic and can damage plant life and human health. In addition, tropospheric ozone — levels of which are rising at 1% a year over industrialized countries — is now a significant contributor to the problem of global warming.

Thus, in addition to human health impacts and local water and air pollution, industrial solvents as a group are also partially responsible for ozone depletion and global warming, the two key environmental issues of this decade. Solvents account for 16% of all industrial CFC use and for an estimated 14% of the total stratospheric ozone depletion to date.

As any user of CFC-113 or methyl chloroform is now aware, ozone depleting solvents have been the subject of worldwide legislative action to phase out their use. Signed in 1987, the Montreal Protocol at first only required consumption freezes or cuts for ozone depleters. But in 1990, the Protocol was expanded to cover more chemicals and strengthened to require their phase-out. UNEP played a central role in promoting the Montreal Protocol and, since its adoption, UNEP/IEO's OzonAction Programme has worked to overcome obstacles to its implementation.

In November 1991, the first international legislation to reduce VOC emissions was agreed under the auspices of the United Nations Economic Commission for Europe. The Geneva Protocol mandates a 30% cut in VOC emissions in Europe and North America by 1999.

Many countries and groups of countries are simultaneously adopting tougher national controls on the most polluting solvents. For example, most industrialized countries have committed themselves to phase out the main ozone depleting compounds more quickly than required under the revised Montreal Protocol.

The development of controls on solvents over the last 30 years contains an irony. As the focus of concern shifted, from explosion to human toxicity to local pollution, less flammable and toxic solvents were progressively introduced. But now that the role of solvents in global environmental issues, such as ozone depletion, has been appreciated, we find that some chemicals introduced to solve earlier problems are themselves now major causes of new problems. CFC-113 is an excellent example.

As a result, industry and governments worldwide are facing a double challenge. First, agreements such as the Montreal Protocol must be implemented and the chemicals they cover phased out as soon as possible. A strong spirit of co-operation will be needed to achieve this, particularly between developed and developing countries and between users and suppliers of ozone depleting chemicals.

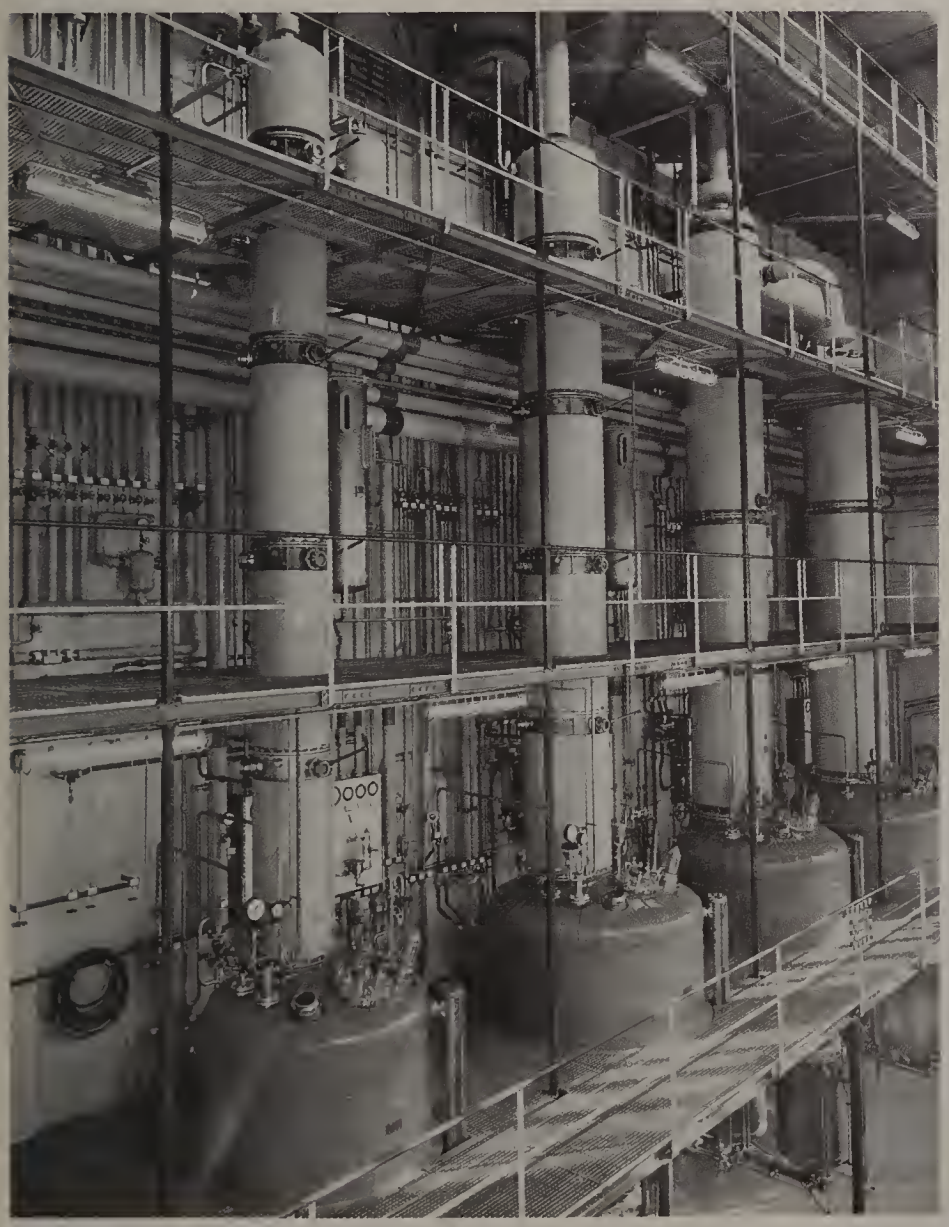
The second challenge for industry and governments is to phase out the most damaging solvents without going back to the more toxic chemicals which they replace. Here the principles of cleaner production, as endorsed and promoted by UNEP/IEO, have a vital part to play.

Because so many solvents have significant environmental impacts, the first question users need to ask is 'Could I accomplish what the solvent has been doing in a different way; or could I change my process (or product) to avoid the need for the solvent altogether?'

In parallel, users of toxic solvents should improve their housekeeping to minimize needless waste and emissions. Numerous studies have shown that significant reductions in worker exposure and environmental releases can be made by means of simple, often managerial changes. What's more, many of these case studies have shown that companies can cut costs at the same time.

Another interim measure for users of toxic solvents is to improve the management of unavoidable waste solvents through recycling or controlled destruction. However, solvent users should evaluate substitution alternatives before investing in this option; its often high capital and running costs mean that companies who embark on this course may find themselves unable to afford other, more long-term, solutions.

Nevertheless, there is a great need for improved management of chlorinated solvent wastes, and schemes set up by leading solvent suppliers to collect used chlorinated solvents for recycling or destruction are therefore to be applauded. Such schemes should be made available to users in all countries.



Many modern solvents are volatile organic compounds (VOCs) which react with sunlight and other compounds naturally present in air to form a variety of secondary pollutants, including ozone. (*Photo courtesy CIBA-GEIGY Limited.*)

Many industrial sectors that use solvents are increasingly considering possible substitutes. In some cases, 'drop-in' replacements exist for solvents which need to be eliminated. But these are often not ideal solutions in environmental terms. A good example is the HCFCs developed to replace CFCs in solvent and other applications. The ozone depletion potential of HCFCs is lower than that of CFCs, but is in most cases still significant.

As a result many solvent users are making more radical substitutions, which require process changes too. For example, in the metal cleaning sector there are now water-based, hydrocarbon and mechanical alternatives to chlorinated solvents. In the coatings industry, water-based paints represent a great environmental improvement over organic solvent-based types.

A word of warning, though. With some exceptions, it is dangerous for solvent users to think that simply by substituting one solvent for another 'safer' one means that they have discharged their environmental responsibilities. There are clear-cut cases where this does hold true, such as the move from organic solvents to water in paints. But in other situations, such as the main substitutes for chlorinated solvents used in cleaning applications, things are more complex.

There are many alternatives now available, but each has its own unique profile of environmental impacts and all need to be planned properly and controlled closely if their use is to result in an overall environmental improvement.

The solution that accords most closely with cleaner production principles is to avoid the need for solvents altogether. 'No-clean' fluxes in the electronics industry provide an elegant example. If the flux leaves an insignificant deposit on printed circuit boards then it does not need to be removed. It is to be hoped that all involved — governments, industry and researchers — will increase their efforts to discover and commercialize solutions of this sort.

Despite the range of technical options available to replace harmful solvents not enough has been done. There are several reasons for this. Many solvent users, especially in developing countries, do not have access to information, either about the health and environmental impacts of the solvents they use or about the alternatives. As a result, managers often have difficulty in accepting and implementing new regulations, let alone taking action ahead of legal controls. Similarly, many workers are not encouraged to or do not adopt simple precautions to avoid breathing solvents.

None of these obstacles are insurmountable, but they point to the vital need for further information regarding all aspects of this problem. By reviewing the subject in various industrial sectors, geographical regions and from different points of view, this issue of *Industry and Environment* seeks to contribute to the growing pool of knowledge regarding solvent use and its environmental impact. We look to both governments and industry to put his knowledge into practice.

Publications

Solubility Data Series

Esters with water

Solubility behaviour of binary systems of esters and water is the topic of Volumes 48 and 49, *Esters with Water*, Parts I and II, of the *Solubility Data Series*. These two volumes concern one of the most useful classes of organic compounds known, being widely used in the food and perfumery industries and as solvents. A precise knowledge of the mutual solubilities of esters and water is important not only for such applications but also for all separation and purification procedures which involve ester–water mixtures.

In the tradition of the *Solubility Data Series*, these two volumes collect together all the quantitative data available, published until 1988, concerning the mutual solubilities of esters and water. Volume 48 includes hydrocarbon esters from the two carbon methyl formate up to esters containing 6 carbon atoms. Volume 49 contains data on esters having 7 or more carbon atoms up to the 32-carbon didodecyl-phthalate.

Where possible, the data for each ester-water system are critically evaluated and mutual solubility values recommended over as wide a temperature range as possible. The solubility behaviour is also presented in graphical form for many of the systems.

These two companion volumes will be of interest to research chemists, chemical engineers, formulating chemists, and environmental scientists.

Esters with Water: Part I, Esters 2-C to 6-C and Part II, Esters 7-C to 32-C *(respectively Volumes 48 and 49 of the* Solubility Data Series*) are edited by F. W. Getzen, G. T. Hefter, and A. Maczynski and published by Pergamon Press, Oxford, UK, 1992. Part I, xxx + 356 pp. ISBN 008 0404 960. Part II, xxx + 248 pp. ISBN 008 0419 089. Price: USD 110.00 each volume.*

Discounts for IUPAC members and affiliates

Members of IUPAC commissions and committees and IUPAC affiliates may purchase volumes of the *Solubility Data Series* at reduced prices:

- USD 35.00 for members whose names appear in the *IUPAC Handbook* or for any individual whose institution has a library subscription.
- USD 77.50 for IUPAC affiliate members.

Place your orders directly with your nearest Pergamon agency, or use the Pergamon Hotline Service in Oxford, Tel: +44 (865) 743 685.

Peter Fogg edited Volume 50 of the *Solubility Data Series*.

Carbon dioxide in non-aqueous solvents at pressures under 200 kPa

Volume 50 of the *Solubility Data Series* has now been published. It contains evaluated data for the solubility of carbon dioxide in about 300 single or mixed non-aqueous solvents at a partial pressure of gas to a maximum of 200 kPa

Measurements of the solubility of carbon dioxide have been carried out for over a hundred years. New techniques have been developed and old techniques modified during this time but some of the early measurements are in close agreement with recent measurements. Reliance may be placed on data when there is good agreement between the measurements of different groups of workers. Unfortunately there are sometimes inconsistencies between measurements by different groups. Judgements have then to be made of the relative reliability of different experimental methods. Difficulties in attaining equilibrium between the gas and liquid phase are an important cause of discrepancies.

Solubility data from the literature have been tabulated in the units given in the original publications. Mole fraction solubilities have been calculated and tabulated if these units were not used by the original authors. The evaluator has assessed the reliability of the various sets of data and expressions giving mole fraction solubility at a partial pressure of 101.3 kPa as a function of temperature have been derived whenever this is justified.

Contents include a brief discussion of the solubility of gases in liquids followed by critical evaluations and solubility data for the following solvents: alkanes and alkenes; aromatic hydrocarbons, alcohols; miscellaneous solvents containing carbon, hydrogen and oxygen; halogen compounds; nitrogen compounds; phosphorus, silicon and sulfur compounds; mixed solvents; mineral oils; animal and vegetable oils and fats; polymeric materials; liquid gases.

Two further volumes in the series will complete the coverage of the solubility of carbon dioxide and are in preparation. One volume will contain evaluated data for the solubility of the gas in aqueous solutions at all pressures. The other volume will contain evaluated data for solubility in non-aqueous solvents at partial pressures of gas greater than 200 kPa.

The importance of reliable solubility data for carbon dioxide cannot be over-emphasized because of the key role played by the gas in the environment, in the chemical industry and in the laboratory. The present book will be of interest to physical, organic and inorganic chemists and to chemical engineers.

Volume 50 of the Solubility Data Series*, entitled* Carbon Dioxide in Non-Aqueous Solvents at Pressures under 200 kPa*, is edited by P. G. T. Fogg and published by Pergamon Press, Oxford, UK, 1992. xv + 484 pp. ISBN 008 040 4952. Price USD 110.00.*

Intermetallics in mercury

Intermetallics in Mercury is Volume 51 of the *Solubility Data Series*. It follows Volume 25, *Metals in Mercury*, of the same series. This nearly 300-page volume details the reactions of metals in mercury, covering the literature until mid-1986. Evaluations of more than 50 systems are presented together with all of the data and citations from the original literature. In addition, over 200 references are given to related literature that describes metal interactions in amalgams but from which quantitative information can only be inferred.

As with earlier volumes in this series, the 'original data' pages present all of the solubility data reported in their original form. For each compound reported, a critical evaluation presents recommended or tentative values of solubilities or solubility products based on statistical treatment of the data reported. Thus the original data and evaluation can be compared easily with new data, and the data can be reanalysed if better procedures for doing so are developed in the future.

This volume contains many references to doctoral dissertations and to the technical literature which are not readily accessible to the general scientific public. It thus brings to the scientific community important original data which would otherwise be effectively lost. Mercury provides a unique solvent for metal–metal reactions, and thus the data reported here are a valuable addition to the experimental basis for better fundamental understanding of interaction of metals in the elemental state. In addition, this material is important technologically in the areas of metal processing, materials, and electrochemistry.

Volume 51 of the Solubility Data Series*, entitled* Intermetallics in Mercury*, is edited by J. Osteryoung and M. Schreiner and published by Pergamon Press, Oxford, UK, 1992. xxxii + 256 pp. ISBN 008 0372 066. Price USD 110.00.*

Alkaline earth hydroxides in water and aqueous solutions

Alkaline Earth Hydroxides in Water and Aqueous Solutions is Volume 52 in the *Solubility Data Series*. It contains evaluated data on the solubility of beryllium hydroxide, magnesium hydroxide, calcium hydroxide, strontium hydroxide and barium hydroxide in water and in a number of electrolyte and nonelectrolyte solutions in water. No data were found for radium hydroxide.

The alkaline earth hydroxides can be divided into two groups depending on the hydration of the solid. First, the sparingly soluble anhydrous beryllium, magnesium and calcium hydroxides, whose freshly precipitated solids are poorly crystalline and show decreasing solubility with aging, and whose solubility in water decreases with increasing temperature. Second, the soluble strontium and barium hydroxide octahydrates that form crystalline precipitates which do not show changes in solubility on aging, and whose solubility in water increases with increasing temperature.

The solubility data are of interest to workers in analytical and inorganic chemistry, and in geology. Recent measurements extend our knowledge of the solubility of magnesium (brucite) and calcium (portlandite) hydroxide into the supercritical dense fluid range of water. Sugar refining, a major application in the past, is still of importance in parts of the world.

Volume 52 of the Solubility Data Series*, entitled* Alkaline Earth Hydroxides in Water and Aqueous Solutions*, is edited by Irma Lambert and H. L. Clever and published by Pergamon Press, Oxford, UK, 1992 xxii + 363 pp. ISBN 0080239579. Price USD 110.00.*

Chemistry teaching around the world

The June 1992 issue of *International Newsletter on Chemical Education* (No. 37) contains descriptions of chemistry teaching from around the world. Doug Hayward (University of British Columbia, Canada) describes 'Do-It-Yourself Chemistry for Elementary Schools' and Mike Quigley (University of Pittsburgh, USA) examines 'Requirements for a Modern Instrumental Analysis Laboratory Course.'

Luis Bello and colleagues from the University of Oriente, Cuba ask 'How do we link Industry to the Chemistry Curriculum?' and Marcellino Magno (University of Philippines) describes 'Some Materials Produced at the University of Philippines' Institute for Science and Mathematics Education Development.'

Mac Zulu and G. D. Peckham (University of Zululand, South Africa) outline 'Chemistry Teaching at the University of Zululand'. They cover the location and origin of the university and its general outlook. They then detail the objectives of the Department of Chemistry and its research areas.

Chemistry teaching around the world: teaching laboratory at the University of Cape Town and (left) Mac Zulu who co-authored a paper on 'Chemistry Teaching at the University of Zululand.'

Alan Cook (Queensland University of Technology, Australia) and N. Russell and J. Stir (Gold Coast University College of Griffith University, Australia) consider 'The Optimization of School Science Resources in Fiji and other Countries of the South Pacific.' Finally, Chris Christofi and Mike Davies (Gillingham School, UK) extol the virtues of drama in the teaching of science in the UK in a paper entitled 'Good Chemistry'.

Greenhouse Earth

In the Preface of the book *Greenhouse Earth* by Annika Nilsson, UNEP Executive Director M. K. Tobal and SCOPE President J. W. B. Stewart write that climate change has become one of the major issues on the international environmental agenda. Predictions of a rising sea levels and devastating droughts have alerted politicians worldwide to the risks of continued increases in the emission of carbon dioxide and other greenhouse gases.

But to change the direction of development is not an easy process. A myriad of political decisions have to be made on a national as well as international level. Those decisions need to be based on facts. The question is then how big a problem climate change really is. How much do the scientists know about what is in store?

Since the greenhouse effect and climate warming were first brought up on the international agenda of environmental problems, many efforts have been made to evaluate critically the scientific base for the predictions about climate change. The first thorough review was a joint effort by 3 international organizations: the International Council of Scientific Unions (ICSU), the United Nations Environment Programme (UNEP), and the World Meteorological Organization (WMO). It was published by ICSU's Scientific Committee on Problems of the Environment (SCOPE) in the report *The Greenhouse Effect, Climatic Change and Ecosystems* (SCOPE 29).

This was the work of a large number of scientists who critically reviewed the existing information on emission of greenhouse gases and their fate in the atmosphere. They looked at climate models and studied past changes in climate trying to assess the potential for sea-level change and the effects of climate and carbon dioxide on agriculture and forestry.

In 1988, WMO and UNEP established the Intergovernmental Panel on Climate Change (IPCC). Two years later, this panel presented an international consensus report based on work and discussions by more than a hundred scientists. It contains a scientific assessment of the state of the atmosphere and potential for changes, an assessment of the impact of climate change and a review of policy options on how to respond to the predicted changes.

These works have provided a scientific base for the discussions about a global climate convention. However, according to Tolba and Stewart, they are not light reading and most policy makers have to depend on short summaries of the conclusions. But when science enters the political arena and conclusions are challenged, short summaries may not provide enough information. UNEP and SCOPE therefore asked science writer Annika Nilsson to write a book about the greenhouse effect and climate change aimed at a non-scientific audience.

Greenhouse Earth attempts to capture the messages in SCOPE and IPCC reports as well as some other information and in a way that is accessible to the non-expert reader. The aim is to provide the reader with a picture of the different factors that scientists enter into their scenarios of the future.

There are 13 chapters:

1. The history of our future;
2. The greenhouse Earth;
3. The greenhouse gases;
4. Adding up the numbers;
5. A model world;
6. Model results — the future climate;
7. Sea level;
8. Agriculture;
9. Forestry;
10. Natural ecosystems;
11. Water, snow and ice;
12. A game of science and politics;
13. Answering the challenge.

Greenhouse Earth *by Annika Nilsson is published on behalf of SCOPE/ICSU and UNEP by John Wiley & Sons, Chichester, UK, 1992. xvi + 219 pp. ISBN 0-471-93628-6. Price GBP 9.95.*

Predictions of rising sea levels and devastating droughts have alerted politicians worldwide to the risks of continued increases in the emission of carbon dioxide and other greenhouse gases.

IUPAC affiliate Nicholas Bodor was one of the co-authors of a paper presented at the Jerusalem symposium. The title was 'Site- and stereospecific drug delivery to the eye'.

Medicinal chemistry

Trends in Medicinal Chemistry '90 contains the texts of most of the invited plenary and main lectures included in the scientific programme of the 11th International Symposium on Medicinal Chemistry. The symposium was organized by the European Federation for Medicinal Chemistry (EFMC) and the Israeli medicinal chemists, and sponsored by IUPAC, the Israel Academy of Sciences and Humanities, the Israel Chemical Society, and the Hebrew University of Jerusalem.

The symposium was held in Jerusalem, Israel, on 2–7 September 1990, a month after the Iraqi invasion of Kuwait. In spite of the danger of war the meeting was well attended by some 400 active participants from 19 European countries, including Eastern Europe and the Soviet Union, as well as from seven countries from other parts of the world, including Australia, Japan, Mexico and the USA.

The 54 articles, which are divided into 12 sections, represent the majority of the invited, plenary and main lectures. The book is intended as a reference work that will be of particular interest to pharmacists, pharmacologists and chemists concerned with the chemical aspects of the action of drugs.

IUPAC affiliates are entitled to a special increased discount of 40% on this book.

The book deviates slightly both in format and in content from the previous volumes, dedicating sections to less frequently reviewed therapeutic areas. Among these are drug chirality, dermatological diseases, natural satietins; formation and metabolism of bones; excitatory amino acids; drug biotransformations and transmembrane transport of drugs; and medicinal plants from China. In addition, sophisticated molecular approaches to drug design to modulate and mimic some receptor and protein functions are presented, as is the rapidly developing field of computer modelling. Important drug delivery modalities, prodrugs and site-specific systems are also reviewed.

The plenary lectures published in the book are:

- Designing drugs for histamine receptors.
- Chemical conversion of vitamin D_3 to its 1,25-dhydroxy metabolite.
- NMDA receptors: agonists and competitive antagonists.
- Protein tyrosine kinase blockers (tyrphostins) as novel antiproliferative drugs.
- New methods of drug targeting.
- Recent advances in the field of mycotoxins.

Besides the six topics included in the plenary lectures, latitude has been granted in addressing the more traditional therapeutic areas of current interest such as CNS agents, cardiovascular agents, chemotherapeutic agents, pharmacodynamic agents and QSAR.

Trends in Medicinal Chemistry: Proceedings of the 11th International Symposium on Medicinal Chemistry held in Jerusalem 1990 *is edited by S. Sarel, R. Mechoulam and I. Agranat and published by Blackwell Scientific Publications, Oxford, UK, 1992. x + 429 pp. ISBN 0-632-03364-9. Price: GBP 65.00/USD 135.00. Affiliate Members discount price GBP 39.50/USD 81.00.*

Recycling of polymers

The IUPAC-sponsored International Symposium on Recycling of Polymers — Science and Technology — was held at the Don Carlos Hotel, Marbella, Spain on 18–20 September 1991 (see *Chem. Intl.* **14**, 85–87, 1992). The proceedings of this symposium have now been published as Volume 57 (May 1992) of the series *Die Makromolekulare Chemie, Macromolecular Symposia.*

In the preface to this volume, symposium editor Prof. Walter Heitz (Universität Marburg, Germany), who is President of the IUPAC Macromolecular Division and was chairman of the symposium, states that in 1950, the total world production of polymers was less than 1.5 million tons. This figure rapidly increased to 70 million tons by 1986 and 84 million tons by 1988. We are currently approaching 100 million tons per year. Although we can be proud of this figure it also represents a challenge — the need to include these products in a closed materials cycle.

Disposal of plastic waste is a subject which, in an ideal world, should not trouble us, suggests Heitz. Recycling of valuable materials has top priority in the protection of the environment. Plastics recycling, however, creates a special problem which does not arise in steel, aluminium or paper recycling. This stems from the immiscibility of most polymer materials and the subsequent deterioration of the properties of recycled polymers.

Ideally, polymers, once they have been classified, should be re-used. However, the development of an ecological cycle should also aim to save energy. The recycling of polymers is only economically viable if we save energy in transferring the product from the end-user to the recycling facility, and this includes cleaning and transportation. During their long service life polymers do save energy and after they have been used may still be regarded as 'refined crude oil'.

Recycling of polymers is an international problem and IUPAC therefore felt that it has a responsibility to help tackle such problems. As a result, it launched its 'Chemistry and the Environment' programme in 1989. All chemistry disciplines were involved in this programme. The IUPAC Macromolecular Division decided to contribute by bringing together expertise on the recycling of polymers from around the world.

National regulations develop faster than known expertise based on experiments. Unbalanced public relation activities sometimes influence expectations resulting in a shift towards solutions that do not correspond to optimum energy saving.

The Macromolecular Division therefore took the initiative in organizing a symposium on 'Recycling of Polymers' totally based on the efforts of science and technology.

The efforts of industry in this direction are much stronger than realized by the public. In Europe, the Association of Chemical Industry has founded 'The European Centre for Plastics in the Environment'. In the USA more than 20 large chemical companies concentrated their activities in 'The Council for Solid Waste Solutions'. The same happened in Japan and a 'Plastic Waste Management Institute' was created.

Representatives of these institutions presented keynote lectures at the Symposium:

- A perspective of the plastic waste issue in the United States (R. Lisemer).
- Plastics waste management in Europe (F. W. Mader).
- Current of plastic waste recycling technologies and their prospects in Japan (R. Iijima).

These contributions are published in this volume together with other symposium lectures — divided into the following sections:

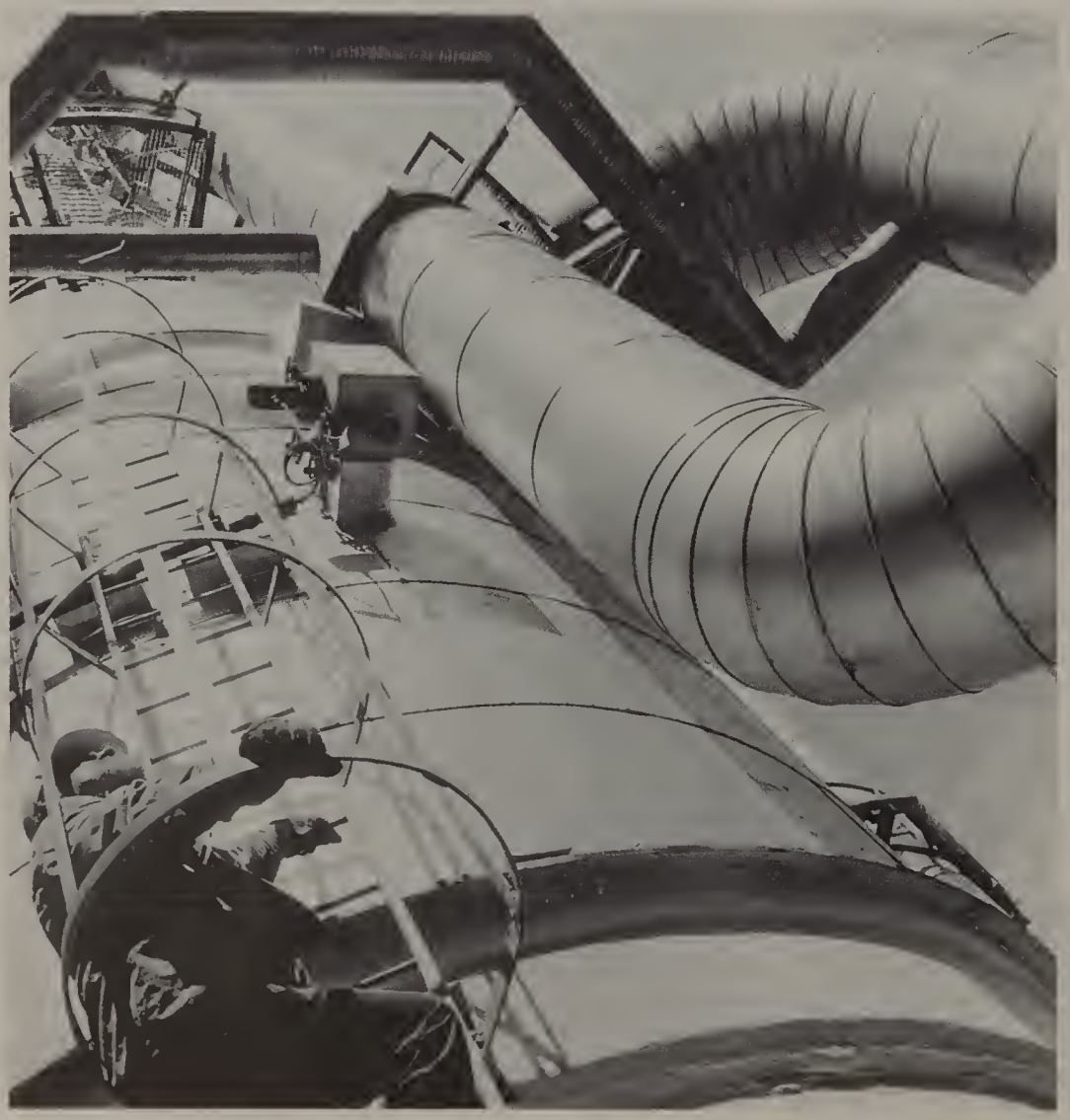
- Technology advances for work up of waste.
- Polymer modification by pyrolysis, solvolysis and hydrogenation.
- Processing of plastic waste.
- Increasing the quality of recycling polymer.

Invited lectures presented at the IUPAC International Symposium on Recycling of Polymers: Science and Technology, Marbella, Spain, on 18–20 September 1991, edited by W. Heitz, were published as Volume 57 of Die Makromolekulare Chemie, Macromolecular Symposia *by Hüthig & Wepf, Basel, Switzerland, May 1992. ix + 395 pp. ISBN 3-85739-249-5. Price SFR 125.00/DEM 148.00/ USD 80.00 + postage and handling.*

Fred W. Mader presents his lecture on 'Plastics waste management in Europe'.

Solution properties of modified polymers

The 8th Bratislava International Conference on Polymers: Solution Properties of Modified Polymers was held in Stará Lesná, High Tatras, Czechoslovakia, on 10–14 June 1991. The Conference was sponsored by IUPAC, Macromolecular Division, in conjunction with the Slovak Academy of Sciences/Slovak Technical University. The Conference Editor was Tomás Bleha (Polymer Institute, Slovak Academy of Sciences, Bratislava).



According to Macromolecular Division President Walter Heitz, the efforts of industry to recycle polymers is much stronger than realized by the public. (*Photo DSM.*)

The scientific programme of the Conference concentrated on the following topics:

- copolymers in solution, formation and structure of micelles, interactions between copolymer components;
- interactions in multicomponent polymer solutions and in polymer blends, experimental and theoretical evaluations of interaction parameters.
- organization of polymer structures by complexation, association and gelation.

Over 70 active participants from 15 countries contributed to the scientific programme which consisted of 10 main lectures, 15 invited contributed lectures and about 40 posters. Most of the invited lectures appear in Volume 58 of *Die Makromolekulare Chemie, Macromolecular Symposia*.

Solution Properties of Modified Polymers, 8th Bratislava International Conference on Polymers, High Tatras, Czechoslovakia, 10–14 June 1991, *edited by T. Bleha, was published as Volume 58 of* Die Makromolekulare Chemie, Macromolecular Symposia *by Hüthig & Wepf, Basel, Switzerland, May 1992. ix + 238 pp. ISBN 3-85739-256-8. Price SFR 74.00/DEM 88.00/ USD 49.00 + postage and handling.*

Rheology of polymer melts

Volume 56 in the above series in concerned with the rheology of polymer melts. The volume includes invited lectures presented at the 14th Discussion Conference of Prague Meetings on Macromolecules held in Prague, on 15–18 July 1991. The Conference was sponsored by IUPAC, Macromolecular Division, in conjunction with the Czechoslovak Academy of Sciences/Czechoslovak Chemical Society. The Conference Editor was Jaroslav Kahovec (Institute of Macromolecular Chemistry, Prague).

The Conference brought together both academic and industrial scientists concerned with deformation and flow of molten polymeric materials. About 100 participants from 20 countries took part in the Conference during which 12 main lectures, 12 special lectures and 40 poster contributions were presented.

Topics covered by the Conference included the state of the art in molecular rheology, microrheology and phenomenological rheology as well as rheometry and rheology-based processing of molten polymeric materials.

Prague was the venue of the Discussion Conference on Rheology of Polymer Melts.

Rheology of Polymer Melts, 14th IUPAC Discussion Conference, Prague, Czechoslovakia, 15–19 July 1991, *edited by J. Kahovec, was published as Volume 56 of Die Makromolekulare Chemie, Macromolecular Symposia by Hüthig & Wepf, Basel, Switzerland, April 1992. ix + 169 pp. ISBN 3-85739-255-X. Price SFR 56.00/DEM 66.00/ USD 37.00 + postage and handling.*

ISO Standards

The following are some of the new international standards announced by the International Organization for Standardization (ISO) in recent issues of *ISO Bulletin*:

May 1992 issue of *ISO Bulletin*

TC27	**Solid mineral fuels**
ISO 1015:1992	Brown coals and lignites — Determination of moisture content — Direct volumetric method
ISO 1213-2:1992	Solid mineral fuels — Vocabulary — Part 2: Terms relating to sampling, testing and analysis
TC 34	**Agricultural food products**
ISO 9116:1992	Green coffee — Guidance on methods of specification
TC 35	**Paints and varnishes**
ISO 1518:1992	Paints and varnishes — Scratch test
TC 45	**Rubber and rubber products**
ISO 1437:1992	Rubber compounding ingredients — Carbon black — Determination of sieve residue
TC 61	**Plastics**
ISO 10354:1992	Adhesives — Characterization of durability of structural adhesive-bonded assemblies — Wedge rupture test
TC 79	**Light metals and their alloys**
ISO 10049:1992	Aluminium alloy castings — Visual method for assessing the porosity
TC 85	**Nuclear energy**
ISO 9892:1992	Uranium metal, uranium dioxide powder and pellets, and uranyl nitrate solutions — Determination of fluorine content — Fluoride ion selective electrode method
TC 102	**Iron ores**
ISO 8263:1992	Iron ore fines — Method for presentation of the results of sintering tests

June 1992 issue of ISO Bulletin:

TC 6	**Paper, board and pulps**
ISO 6587:1992	Paper, board and pulps — Determination of conductivity of aqueous extracts
TC 17	**Steel**
ISO 9477:1992	High strength cast steels for general engineering and structural purposes
TC 27	**Solid mineral fuels**
ISO 7936:1992	Hard coal — Determination and presentation of float and sink characteristics — General directions for apparatus and procedures
TC 28	**Petroleum products and lubricants**
ISO 8754:1992	Petroleum products — Determination of sulfur content — Energy-dispersive X-ray fluorescence method
TC 44	**Welding and allied processes**
ISO 9455-5:1992	Soft soldering fluxes — Test methods — Part 5: Copper mirror test
TC 45	**Rubber and rubber products**
ISO 1407:1992	Rubber — Determination of solvent extract
TC 48	**Laboratory glassware and related apparatus**
ISO 4790:1992	Glass-to-glass sealings — Determination of stresses
ISO 10345-1:1992	Glass — Determination of stress-optical coefficient — Part 1: Tensile test
ISO 10345-2:1992	Glass — Determination of stress-optical coefficient — Part 2: Bending test
TC 54	**Essential oils**
ISO 4720:1992	Essential oils — Nomenclature
TC 102	**Iron ores**
ISO 4687-1:1992	Iron ores — Determination of phosphorus content — Part 1: Molybdenum blue spectrophotometric method

Chemistry International: Guidelines for Authors

Chemistry International (*CI*) is the news magazine of the International Union of Pure and Applied Chemistry (IUPAC). The aims of the magazine are:

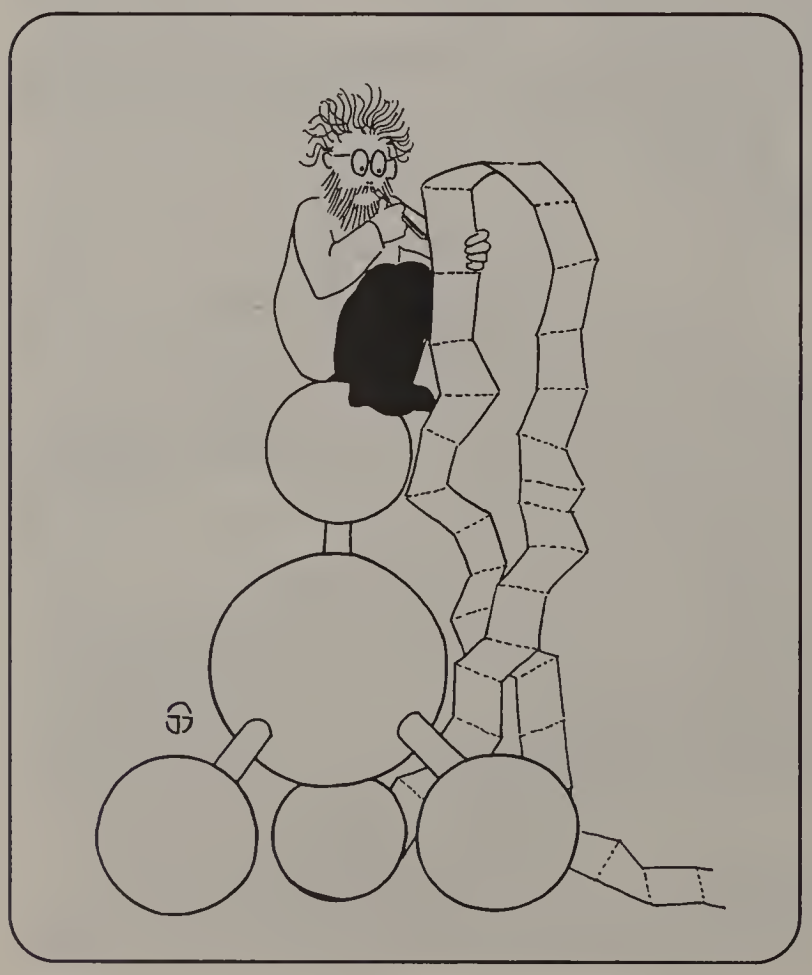
- to be informative about IUPAC and especially its scientific work;
- to be interesting and readable;
- to provide a forum for the expression of views.

The magazine publishes news, views and reports on IUPAC, its people, its commissions and committees its national adhering organizations (NAOs), its associated organizations, its company associates, its affiliate membership programme, its meetings, its publications and recommendations and its conferences. It also publishes feature articles on topics linked to the work of the Union.

CI has a world-wide readership consisting mainly of members of IUPAC bodies, IUPAC affiliates and other scientists interested in the work of the Union. These readers include chemistry teachers in schools and colleges, university lecturers and professors, and chemists working in industry and public service.

Types of contribution

The editor is happy to consider unsolicited contributions and suggestions for contributions for publication, especially from affiliates and members of IUPAC bodies. There is particularly a need for short items and letters are always welcome. Intending authors of feature articles and short reports are advised to contact the editor before submitting their material.



All articles and reports should be linked to IUPAC, its work and its interests. Feature articles and shorter items should be of general interest to chemists who are not specialists in the subject of the article. Specialist terms, acronyms and abbreviations should therefore be explained. However, generally accepted acronyms (such as DNA, NMR and HPLC) may be used. Care should be taken to avoid jargon and colloquialisms.

IUPAC nomenclature and SI units should always be used.

Authors are usually invited to submit black-and-white photographs and/or figures to illustrate their articles or reports. Authors should aim to provide, if possible, one photograph or illustration, for every 500 words of text.

Feature articles. Feature articles of up to 3000 words are published in *CI*. Some are solicited, others unsolicited. Unsolicited articles are sent to referees for comment. An author of a feature article is invited to write an introductory paragraph summarizing the article. This should include some reference to IUPAC. The paragraph is printed in bold at the beginning of the article.

Commission & Committee News. Items in this section are based on summary minutes of commission and committee meetings. Guidelines on how to write summary minutes for *CI* are sent to all commission and committee chairmen and secretaries each year.

Short reports. Short reports and news items of up to 1000 words on conferences, the work of IUPAC commissions and committees, associated organizations, affiliate activities and so on are always welcome.

Filler items. Filler items of up to 200 words are also welcome. Humorous items, anecdotes, verse, announcements and quotations are all acceptable and may be accompanied by cartoons, figures or photographs.

Letters. *CI* has a correspondence column the aim of which is to provide a forum for the expression of views on IUPAC and its activities. A correspondent should make clear to the editor that the letter is intended for publication! It should normally not exceed 500 words and may be accompanied by a cartoon or photograph.

Cartoons. Most issues of *CI* contain at least two cartoons. These usually relate to some aspect of the work of the Union. Cartoons and ideas for cartoons submitted by affiliates and members of IUPAC bodies will always be considered for publication.

Photographs. Photographs of IUPAC activities and IUPAC people in the news are published in the "News and Views" section of *CI*.

Obituaries and tributes. *CI* does not publish obituaries and tributes. However, it does publish announcements of the deaths of scientists who have worked on the Union's commissions and committees.

Chemistry International (*CI*) publishes news, views and reports on IUPAC and its activities including IUPAC-sponsored conferences. Its world-wide readership includes chemistry teachers in schools and colleges, uiniversity lecturers and professors, and chemists working in industry and public service.

Submission and acceptance of contributions

The editor, in consultation with the *CI* Editorial Advisory Board, reserves the right to accept, reject and edit, in accordance with editorial policy and *CI* style, all material submitted for publication. Feature articles, when edited, are normally referred back to the author(s) for comment and approval. Proofs are not sent to authors.

Presentation. Articles, reports and other items should be typed or presented as hard copy with double spacing on one side only of white A4/American quarto paper using margins of at least 3 cm.

All items should clearly indicate the title and name of the author(s). Each page should be numbered together with the name(s) of the author(s).

Tables and references should be presented in the usual style of *CI*. Authors are asked to refer to recent issues of *CI* to determine this style. References should be kept to a minimum.

Authors may submit articles on floppy diskette together with hard copy as described above. Disks should be IBM- or Macintosh-compatible. Details should be given of the type of computer used, the software employed and the disk operating system.

Use of titles and first names. When authors refer to other scientists in their articles or reports they should, wherever possible, give their titles and first names as well as their family names, for example: 'Professor Joseph Bloggs' is preferred to 'J. Bloggs.'

Illustrations. Figures should be submitted on separate sheets and numbered to link in with the text. Figures and cartoons may be redrawn by editorial staff or the publishers.

Photographs should be large, glossy, black and white prints. In certain cases, however, colour prints are acceptable. Transparencies and negatives should not normally be submitted.

All figures, cartoons and photographs should be accompanied by suitable captions where appropriate.

The author(s). Authors of feature articles are invited to submit a paragraph or two about themselves, their work and their links with IUPAC and also a black-and-white photograph. This can be a head and shoulders photograph or preferably a photograph showing the author at work — in an office or laboratory, for example.

Publication schedule. The publishers of *CI* operate on a nine week production schedule. Authors of even the most 'urgent' material should allow at least one week for editing at the IUPAC Secretariat. The MINIMUM time therefore between receipt of material at the Secretariat and publication is ten weeks. This period can be considerably longer — especially if a deadline is just missed. It is sometimes necessary to postpone publication of less urgent items from one issue to the next.

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Payment. *CI* does not offer payment to authors.

Reprints. Authors do not receive free reprints of their articles. However, upon request, the editor can arrange with the publishers to quote a price for offprints.

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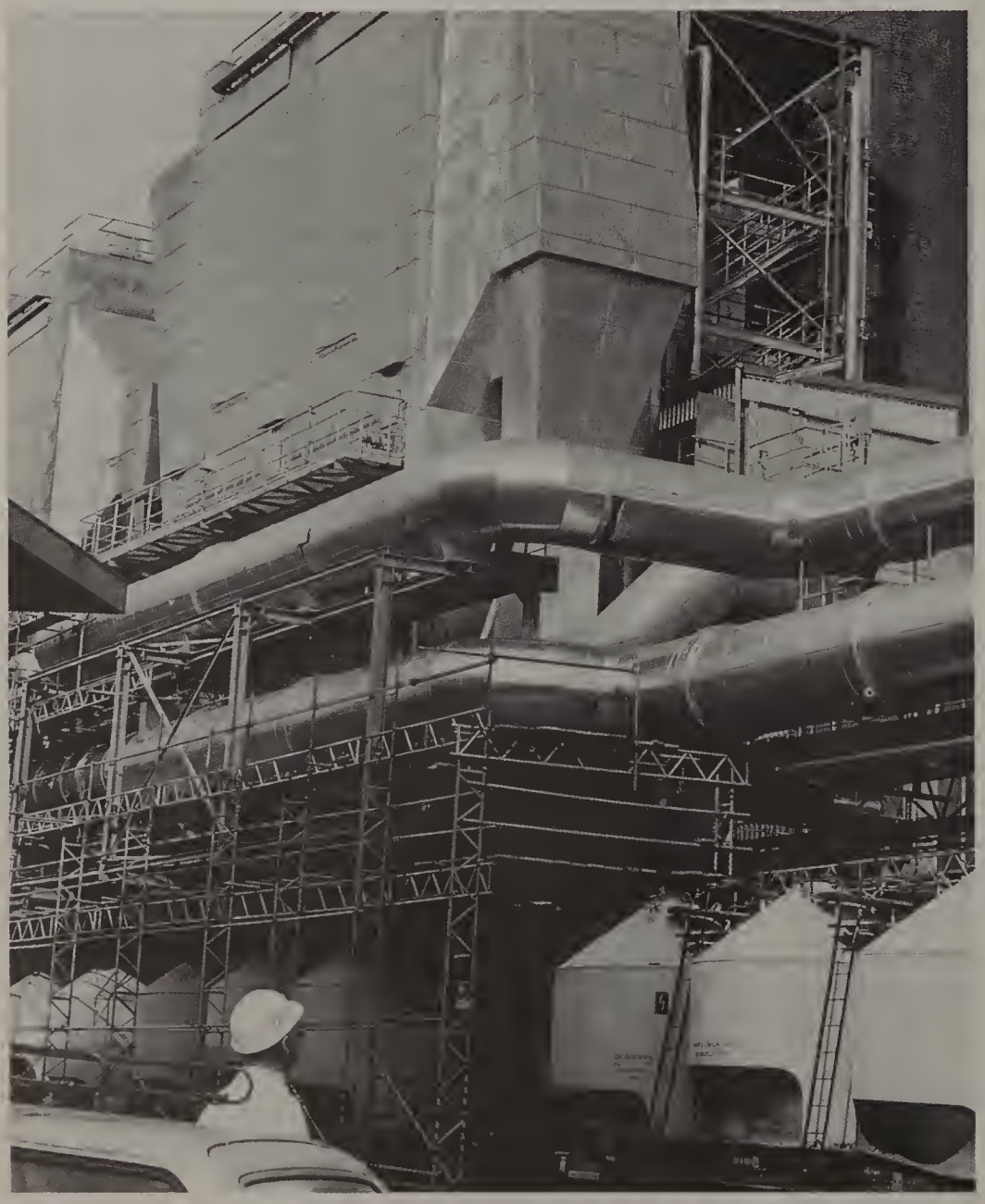
Conferences

Safety in chemical production
Yokohama, Japan
31 May–5 June 1993

IUPAC SPONSORED

In the light of chemical accidents over the past decade and also the recent interest in global environmental problems, IUPAC considered that the issue of safety in chemical production and technologies handling chemical substances was one of its greatest challenges.

Accordingly, the Union held its 1st International Workshop on Safety in Chemical Production in Basel, Switzerland in 1990 in cooperation with Swiss chemical companies. Industrial, governmental, and academic experts from industrialized and developing countries were invited to attend the workshop. The United Nations Industrial Development Organization (UNIDO) helped by inviting participants from developing nations.



Safety management at chemical plants in Europe, Japan and the USA will be one of the topics of the 2nd IUPAC Workshop on Safety in Chemical Production.

On the basis of the success of this workshop, IUPAC decided to hold a second workshop on the same theme in Japan, where the chemical industry has developed extensive technologies and expertise on safe chemical production and has made extensive investments to facilitate environmental protection. The workshop will be held in Yokohama in cooperation with Japanese chemical companies and the Japanese Chemical Society.

For any specific chemical process there may be several safety options depending on the differing governmental regulations and the varying educational or technical backgrounds of the workers. The aim of the second workshop is to throw light on the present state of safety and environmental protective measures for selected chemical processes. Government experts, representatives from educational institutions, and industrialists world-wide will have the opportunity of learning about the specific examples presented and selecting those innovations which could be implemented in their home countries.

The workshop aims to involve about 400 industrial, governmental and academic experts on safety in chemical production and safety education from both industrialized and developing nations. It will provide participants with an opportunity to exchange detailed information and to discuss safety. The workshop will also provide, through lectures and factory visits, an excellent opportunity to learn about technologies developed by their Japanese counterparts. Participation from developing countries, with the help of UNIDO, will be mainly by invitation.

The following are the workshop sessions:

1. *Safety Management*: Safety management at chemical plants in USA, Europe and Japan; The role of the government in safety management in Japan; Safety management at universities and in laboratories

2. *Education and Training*: At universities; For plant operation; Global network for safety in chemical production

3. *Evaluation of hazards*: Evaluation of energy hazards for reactive chemicals; Material safety database; Hazards evaluation for new chemicals and their safety management; Evaluation of energy hazards for chemical processes; Hazard analysis

4. *Engineering*: Risk reduction at hazardous chemical plants; Controlled systems using artificial intelligence techniques; Fuzzy control systems for chemical plants; Factory automation in chemical plants; Inspection standards for chemical plants; On-stream inspection techniques

5. *Factory Visits and Case Studies*:
Nippon Petrochemical Co., Ltd — Hazards analysis;
Tonen Chemical Corp. — Maintenance and inspection system;
SHOWA DENKO K.K — Practice of PKY and KY;
Asahi Chemical Industry Co. Ltd — Safety education;
Tokyo Gas Co. Ltd — Antiseismic counter-measurement;
Ishikawajima Harima Heavy Industries Co. Ltd — Experiment of facility against earthquake;
Ajinomoto Co. Inc. — Food production;
Toyo Sanso Co. Ltd — Safety on semi-conductor gases;
Kirin Brewery Co. Ltd — Safety management of bio-industry; Mitsubishi Kasei Corp. — Safety for research and development;
Nissan Motors Co. Ltd — Safety management at an automobile plant;
NKK — Safety management at a steel plant;
Fire Research Institute, Fire Defence Agency — Experiment on tank fire and ignition.

6. *Group and panel discussions*: Hazard evaluation of chemical reactions; Thermal analysis; Bio-safety; Dust explosion; Electrostatics hazards; Review and modification of safety operation manuals; Safety education at universities; Safety education in industry; Organization of 'Safety Education and Training Center'; Future work of the IUPAC Committee on Chemistry and Industry (COCI).

The official languages of the workshop will be English and Japanese with simultaneous interpretation provided.

The Organizing Committee is planning a number of social events and general interest programmes including factory visits near Yokohama.

Yokohama is well provided with furnished accommodation for visitors. The Organizing Committee has already made tentative hotel reservations for overseas participants.

The registration fees, before 1 April 1993, are:

JPY 40 000 for participants,
JPY 20 000 for students and
JPY 10 000 for accompanying persons.

The weather at the beginning of June in Japan is calm and warm — the temperature being about 20°C.

Yokohama can be reached by train from Narita International Airport (90 min) or from Tokyo (30 min). From Haneda International and Domestic Airport it is about 40 minutes by train.

Yokohama is a major international harbour. It was opened just before the Meiji Restoration. The combination of beautiful coastline and lovely streets, gardens and modern buildings is a notable feature of many seaside cities in Japan. Many famous resort areas lie within 100 km of Yokohama: Mt Fuji-Hakone National Park, Atami (the biggest spa in Japan), Izu and Miura peninsula (with their beautiful picnic areas).

Ayre Hall, Knoxville Campus, The University of Tennessee: in July, foliage in the area is unsurpassed. George Kabalka is Professor of Chemistry at the University and Chairman of the Local Organizing Committee

Boron chemistry
Knoxville, Tennessee, USA
11–15 July 1993

IUPAC SPONSORED

The 8th International Meeting on Boron Chemistry (IMEBORON VIII) will be held at the University of Tennessee, USA, on 11–15 July 1993.

Current research in all areas of boron chemistry will be highlighted. The meeting is designed to encourage interaction between the various disciplines involving boron. The forms of communication at IMEBORON VIII will be plenary lectures, invited lectures, contributed papers and posters. As currently planned, all contributors will be invited to submit their presentations for inclusion in the conference proceedings to be published as The Chemistry of Boron. The meeting will also feature commercial exhibits of products, equipment, and instrumentation.

IMEBORON VIII will focus on current topics in all areas of boron chemistry. The scientific programme will cover state of the art advances in the organic, inorganic, theoretical, biological, medical, and material science aspects of boron. As in previous meetings, lectures will be presented in parallel sessions.

At the time of writing, prominent scientists are being invited to participate as plenary and session lecturers. Nobel Laureates in boron chemistry, H. C. Brown and W. N. Lipscomb, are planning to participate.

The official language of IMEBORON VIII will be English.

The registration fees have been kept as low as possible and include all meeting materials, lunches from Monday to Thursday, ground transportation for group events, social hours and the official banquet. The fees before/after 93.01.03 are USD 250/300; USD 125/150 for students and USD 125 for accompanying persons. IUPAC affiliates are entitled to a 10% reduction in the full fees.

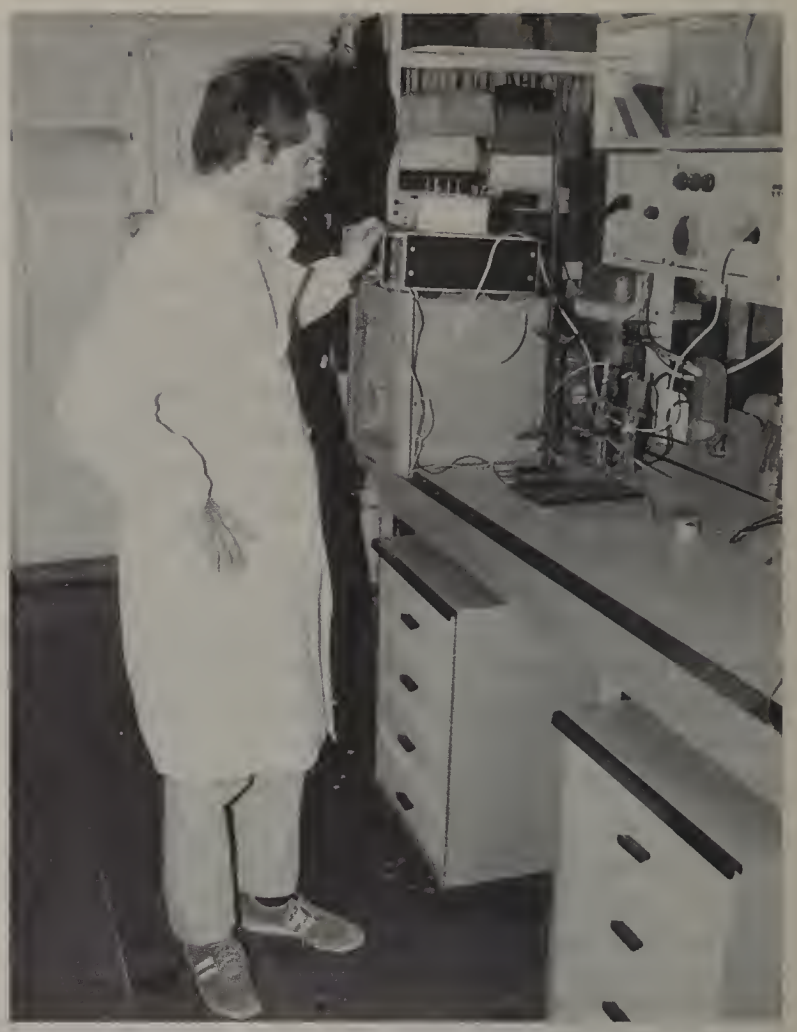
Accommodation will be in first class hotels at a projected rate of USD 65.00 per day. All hotels are within walking distance of the meeting center on the University of Tennessee campus. Air conditioned student dormitory accommodation will also be available at a projected rate of USD 15 per day.

Conference social events and activities will include receptions, a symposium banquet, a river boat-ride, shopping expeditions and tours of regional attractions.

Knoxville's McGhee Tyson airport is served by every major US carrier. Service to Knoxville originates at nearly all of the major 'hubs' such as Atlanta, Dallas, and Cincinnati.

Knoxville is the urban gateway to the Great Smoky Mountains, the most visited national park in the United States. Located in the Tennessee River valley and surrounded by lakes and mountains, the city is full of rich and colourful heritage and offers visitors a diverse range of activities. In July, the area foliage display is unsurpassed and the temperatures range from 20 to 25°C.

The University of Tennessee, Knoxville was one of the earliest universities established on American's first frontier. It was founded in 1794, just 18 years after America declared its independence.



Mechanochemistry research at the Institute of Solid State Chemistry, Novosibirsk, Russia.

Prof. Vladimir Boldyrev is President of the INCOME International Advisory Committee and President of the International Mechanochemical Association.

Mechanochemistry

The 1st International Conference on Mechanochemistry (INCOME) will be held at Kosice, Czechoslovakia, on 23–26 March 1993. This is the first event of the International Mechanochemical Association (IMA) — an Associated Organization of IUPAC.

The following are the conference topics:

1. Fundamentals and models of mechanically stimulated processes.
2. Ultrafine grinding and mechanical activation: methods, apparatus.
3. Mechanochemical reactions and mechanical alloying.
4. Applications of mechanochemistry.

The official language of the conference will be English. The Proceedings will also be published in English.

Kosice is a beautiful old Slovak town. The gothic cathedral, situated in the very East of Europe, is a complex of historical buildings on the Main Street. The town is attractively situated near the Slovak mountain High Tatras.

For further information, please contact: Prof. Klára Tkácová, INCOME Bureau, Banícky ústav SAV, Solovjevova 45, 043 53 Kosice, Czechoslovakia. Tel: +42 (95) 307 90. Fax: +42 (95) 343 92.

Electrochemical technology of molten salts

A European Workshop on Electrochemical Technology of Molten Salts will be held at the Hotel Tivoli Sintra, Sintra, Portugal, on 14–17 March 1993.

The workshop will consider the contribution of fundamental studies of molten salt chemistry and electrochemistry to the improvement of industrial processes in two fields: (1) molten salt extractive metallurgy (chemical processes and electrotwinning applied to aluminium, refractory metals, rare earths and other non-common metals) and (2) high-temperature fuel cells and batteries.

Further information from (a) César Sequeira, Instituto Superior Técnico, Av. Rovisco Pai, 1096 Lisboa Codex, Portugal; (b) Gérard Picard, Ecole Nationale Superieure de Chemie de Paris, 11 r. P. et M. Curie, 75231 Paris Cedex 05, France.

Conference Calendar

Conference circulars and registrations forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in italics.

1992

Mycotoxins and phycotoxins

8–12 November.
8th International Symposium on Mycotoxins and Phycotoxins.
Mexico City, Mexico.
Dra. Magda Carvajal, Secretariado del Simposio, VIII Simposio Internacional IUPAC sobre Micotoxinas y Ficotoxinas, Insurgentes Sur 3700-C, Apartado Postal 101-63, 04530 México, D.F. Tel: +52 (5) 550 5883. Fax: +52 (5) 548 8207. Telex: 1774523 UNAMME.

Chemical education

17–21 December.
12th International Conference on Chemical Education.
Bangkok, Thailand.
Dr Somjai Wichaidit, The Chemical Society of Thailand, c/o Research Center, Ramathibodi Hospital, Rama VI Road, Bangkok 10400, Thailand. Tel: +66 (2) 245 9648 or 201 1447. Fax: +66 (2) 246 2123 or 201 1611.

1993

Thermodynamics of solutions and biological systems

3–6 January.
International Conference on Thermodynamics of Solutions and Biological Systems.
New Delhi, India.
Prof. J. C. Ahluwalia, Department of Chemistry, Indian Institute of Technology, Hauz Khas, New Delhi - 110016, India. Tel: +91 (11) 653 474/653 576 (office), +91 (11) 664 519 (home). Fax: +91 (11) 686 2037. Telex: 317 3087 or 316 1460 - IITD-IN.

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all bona fide chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all bona fide chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

Protein structure function

8–13 January.
3rd International Symposium on Protein Structure Function.
Karachi, Pakistan.
Prof. Z. H. Zaidi, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan.

Characterization of porous solids

9–12 May.
3rd International Symposium on Characterization of Porous Solids (COP-111).
Marseille, France.
Prof. J. Rouquerol, Centre de Thermodynamique et de Microcalorimetrie du CNRS, 26 rue du 141 ème RIA, 13003 Marseille, France.

Safety in chemical production

31 May–4 June.
2nd IUPAC Workshop on Safety in Chemical Production.
Yokohama, Japan.
Prof. K. Tamaru, Japan IUPAC Workshop Committee, c/o The Chemical Society of Japan, 1–5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan. Tel: +81 (3) 3292-6161. Fax: +81 (3) 3292-6318. Telex: 02226198 CSJ J.

Bioorganic chemistry

6–10 June.
2nd International Symposium on Bioorganic Chemistry.
Fukuoaka, Japan.
Symposium Secretariat, 2nd International Symposium on Bioorganic Chemistry, Department of Chemical Science and Technology, Faculty of Engineering, Kyushu University 36, Higashi-ku, Fukuoka 812, Japan. Fax: +81 (92) 632 1842.

Carotenoids

20–25 June.
10th International Symposium on Carotenoids.
Trondheim, Norway.
Prof. S. Liaaen-Jensen, Laboratory of Organic Chemistry, The Norwegian Institute of Technology, University of Trondheim-NTH, N-7034 Trondheim-NTH, Norway.

Multiphoton processes

24–30 June.
6th International Conference on Multiphoton Processes (ICOMP VI).
Québec, Canada.
Dr. S. L. Chin, Faculté des Sciences et de Génie, Centre d'optique, photonique et laser, Université Laval, Paveillon Alexandre-Vachon, Cité universitaire, Québec, Canada GiK 7P4. Tel: 1 (418) 656 2454.

Macrocyclic chemistry

27 June–2 July
18th International Symposium on Macrocyclic Chemistry.
Enschede, Netherlands.
Prof. D. N. Reinhoudt, Department of Chemical Technology, University of Twente, P.O. Box 217, 7500 AE Enschede, Netherlands.

Cationic polymerization

5–8 July.
11th International Symposium on Cationic Polymerization and Related Ionic Processes.
Borovets, Bulgaria.
Prof. I. M. Panayotov, Institue of Polymers, Bulgarian Academy of Sciences, BG-1113 Sofia, Bulgaria.

Boron chemistry

11–15 July.
8th International Meeting on Boron Chemistry (IMEBORON VIII).
Tennessee, USA.
IMEBORON VIII, University of Tennessee Conference Center, PO Box 2468, Knoxville, TN 37901-2648, USA. Tel: +1 (615) 974 0250. Fax: +1 (615) 974 0268.

Optics and dynamics of polymers

12–15 July.
33rd Microsymposium on Macromolecules, Optics and Dynamics of Polymers.
Prague, Czechoslovakia.
33rd Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 6, Czechoslovakia. Tel: +42 (2) 360 317. Fax: +42 (2) 367 981. Telex: 122019 IMCP C.

Fluorinated monomers and polymers

19–22 July.
34th Microsymposium on Macromolecules, Fluorinated Monomers and Polymers.
Prague, Czechoslovakia.
34th Microsymposium, P.M.M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162-06 Prague 6, Czechoslovakia. Tel: +42 (2) 360 317. Fax: +42 (2) 367 981. Telex: 122019 IMCP C.

IUPAC General Assembly

5–12 August.
37th IUPAC General Assembly.
Lisbon, Portugal.
The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.

IUPAC Congress

15–20 August.
34th IUPAC Congress.
Beijing, China.
Prof. Xinqi Song, Secretary General of 34th IUPAC Congress, c/o Chinese Chemical Society, PO Box 2709, Beijing 100080, China. Tel: +86 (1) 256 8157 or 256 4020. Telex: 20035 CAST CN c/o CAST.

Solution chemistry

15–21 August.
23rd International Conference on Solution Chemistry.
Leicester, UK.
Dr M. J. Blandamer, Department of Chemistry, Leicester University, University Road, Leicester LE1 7RH, UK.

Macromolecule–metal complexes

30 August–3 September.
5th International Symposium on Macromolecule–Metal Complexes.
Bremen, Germany.
Prof. D. Wöhrle, Institute of Organic & Macromolecular Chemistry, University of Bremen, Leobener Str. NW 11, W-2800 Bremen 33, Germany.

Advanced polymer materials

6–10 September.
International Conference on Advanced Polymer Materials.
Dresden, Germany.
Prof. H.-J. Jacobasch, Institute of Polymer Research Dresden, PO Box 411, 0-8012 Dresden, Germany.

1994

Natural products chemistry

16–20 January.
19th International Symposium on Natural Products Chemistry.
Karachi, Pakistan.
Prof. Atta-ur-Rahman, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan.

Macromolecules

11–15 July.
35th International Symposium on Macromolecules.
Ohio, USA.
Dr J. P. Kennedy, Institute of Polymer Science, University of Akron, Akron, OH 44325-3909, USA.

Coordination chemistry

24–29 July.
30th International Conference on Coordination Chemistry.
Kyoto, Japan.
Prof. H. Ohtaki, Laboratories of Coordination Chemistry, Institute for Molecular Science, Myodaiji-cho, Okazaki 444, Japan.

Physical organic chemistry

September.
12th International Conference on Physical Organic Chemistry.
Padova, Italy.
Prof. G. Scorrano, Dipartimento di Chimica Organica, Università degli Studi di Padova, Via Marzolo 1, 35100 Padova, Italy. Fax: +39 (49) 831 222.

Organic synthesis

December.
10th International Conference on Organic Synthesis.
Bangalore, India.
Prof. G. S. R. Subba Rao, Department of Organic Chemistry, Indian Institute of Science, Bangalore 560 012, India.

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IUPAC Handbook 1991-1993

Published for the International Union of Pure and Applied Chemistry by Blackwell Scientific Publications Ltd.

The 1991-1993 Handbook is intended to provide, in one volume, detailed information on the membership, working programmes, and rules of operation of IUPAC. It will be a useful reference source for chemists and chemical organisations worldwide.

IUPAC

Outline of Contents: Organization of IUPAC 1991-1993; Table of contents for membership lists; International Union of Pure and Applied Chemistry; IUPAC officers and secretariat; Past officers of IUPAC; General assemblies and congresses of IUPAC; Membership lists of IUPAC bodies 1991-1993; National adhering organizations; Observer countries; Associated organizations; Company associates; Executive committee and bureau; Standing committees; Divisions/Section and their commissions, subcommittees, working parties and sub-groups; Standing orders from executive committee; Alphabetical index to members of IUPAC bodies 1991-1993; Current programmes 1992: Guidelines for IUPAC programmes; Standing committees; Divisions; Section; Appendix I - Reports published 1990-1991; Appendix II - Guidelines for applying for sponsorship of symposia, symposia sponsored by IUPAC (as at 31st March 1992); Appendix III - Procedure for comment and approval of IUPAC recommendations on nomenclature and symbols, guidelines for drafting IUPAC Recommendations 1992; Statutes and Bylaws; Appointment and functioning of national representatives; Rules of divisions; Terms of reference for divisions/section and commissions; Affiliate membership programme; List of abbreviations; Stop Press.

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International Union of Pure and Applied Chemistry (IUPAC)

IUPAC

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.
Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 44 countries, each represented by a national organization, such as an academy of science or research council.

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Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
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Australian Academy of Science **(Australia)**
Österreichische Akademie der Wissenschaften **(Austria)**
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